198131

JPRS-UMA-86-030

12 JUNE 1986

# USSR Report

## MILITARY AFFAIRS

FOREIGN MILITARY REVIEW

No 1, JANUARY 1986







FBIS FOREIGN BROADCAST INFORMATION SERVICE



11
75
A04

## NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

## PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-UMA-86-030

12 JUNE 1986

# USSR REPORT

# MILITARY AFFAIRS

# FOREIGN MILITARY REVIEW

No 1, January 1986

Except where indicated otherwise in the table of contents, the following is a complete translation of the Russian-language monthly journal ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, published in Moscow by the Ministry of Defense.

## CONTENTS

PUBLICATION DATA


| | |
|---|---|
| English title | : FOREIGN MILITARY REVIEW, No. 1, 1986 |
| Russian Title | : ZARUBEZHNOYE VOYENNOYE OBOZRENIYE |
| Author (s) | : |
| Editor (s) | : I.I. Bugrov |
| Publishing House | : Voyenizdat |
| Place of Publication | : Moscow |
| Date of Publication | : January, 1986 |
| Signed to press | : 10 January 1986 |
| Copies | : |
| COPYRIGHT | : "Zarubezhnoye voyennoye obozreniye" |

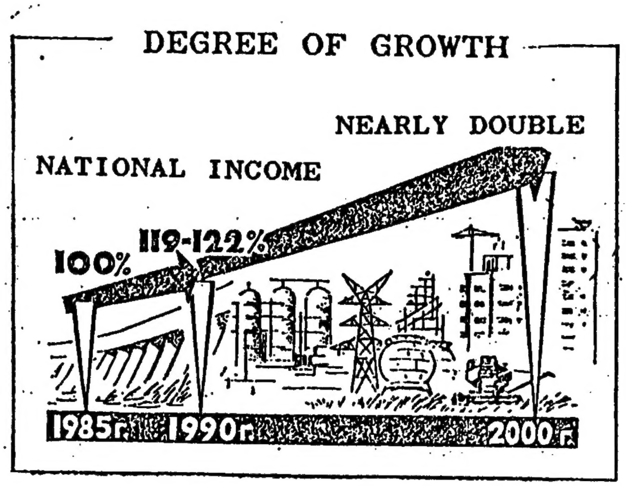
## EDITORIAL REVIEWS MAIN POLICY THEMES PRIOR TO CONGRESS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 3-6

[Editorial]

[Text] Soviet Army and Navy Day is a joyful and festive holiday in our cities and villages, in the units and aboard ship. Together with the Soviet people, the workers and warriors of the armies of the countries of the socialist community and our friends abroad celebrate this day. Created by the great Lenin and nurtured by the Communist Party, the Soviet Army and Navy have guarded with honor the gains of the Great October Revolution for 68 years and selflessly serve the cause of building the most humane and just society on earth--a communist one.

This anniversary is especially significant. It coincided with an historic event--the eve of the opening of the 27th Soviet Communist Party Congress. Just as all the Soviet people, the armed defenders of the gains of October enthusiastically received the pre-Congress documents approved by the October (1985) CPSU CC Plenum--drafts of a new version of the Party Program, changes in the CPSU constitution, and the basic directions of the USSR's economic and social development for 1980-1990, and the period to 2000. Business-like and creative discussions of them in party meetings and conferences in workers' and soldiers' collectives took the form of a direct party consultation with all the Soviet people and were nurtured in a vivid demonstration of the ideological and political unity of our people, their cohesion in support of the Leninist party, their determination to go to new heights in perfecting socialism, in raising the Motherland's economic and defensive might.




The plans put forth by the Party are truly grandiose! In the coming

15 years, there are plans to create an economic potential roughly equal to that amassed in all the previous years of Soviet Power. National income and the volume of industrial production will almost double. The Party's plans rest upon a solid foundation. The labor of the Soviet people has created a powerful economic, scientific-technical and cultural potential. Our country has highly qualified cadres, possesses a mighty industry and a large mechanized agriculture. The USSR occupies a leading position in the world in many areas of development in science and technology. During the fulfillment of the decisions of the XXVI CPSU Congress, a great step was taken in raising the living standard of the Soviet people and the development of all branches of the economy.

Soviet soldiers are proud that our Motherland is successfully building communism, standing unshakable like a mighty bastion of peace and progress, eliciting the admiration and respect of all people of good will who warmly approve and support the wise and prescient domestic and foreign policy of the CPSU and the Soviet state, which meet the basic interests of the people. They are fully aware that the Soviet people and its armed forces are indebted to the Communist Party, to its constant concern about strengthening the defensive might of the Soviet state, for all their successes. The CPSU leadership has put armed defense of the socialist Fatherland as the chief source of the army's and navy's might, and an indispensible condition for victory over any enemy who would try to encroach upon the great gains of socialism in our country. The entire heroic history of the Soviet state and its armed forces testify eloquently to this.

The Communist Party was able to mobilize all the forces of the people and its still very young Red Army for a crushing defeat of numerous hordes of foreign invaders and White Guards in the incredibly difficult years of the Civil War and foreign intervention. The dark forces of imperialism and reaction were routed. The land of the Soviets won its first decisive battle in the engagement with the combined forces of imperialism.

Having routed the intervention and internal counter revolution, the Soviet people set out to build socialism. But the Party did not forget for one minute V. I. Lenin's instructions on the necessity tirelessly to strengthen the defensive potential of the socialist Fatherland and to heighten vigilance towards any type of enemy intrigues. Following the great leader's behest, our people strengthened the economy and defense of our state. The industrialization of the country and collectivization of agriculture proceeded at unprecedented rates and a cultural revolution was being accomplished. The moral-political unity of Soviet society grew stronger from year to year. All this has raised the USSR's might to a new, higher level.

Profound transformations in the country allowed for a significant strengthening of its defensive might and an increase in the USSR's armed forces' combat potential. The latest combat equipment was given to the army and navy. The Party devoted special attention to training the personnel and increasing the moral-combat qualities. By the beginning of the Second World War, we had made the world's best tanks and aircraft, and had begun to mass produce them. In a word, the foundation was laid for our future victory in

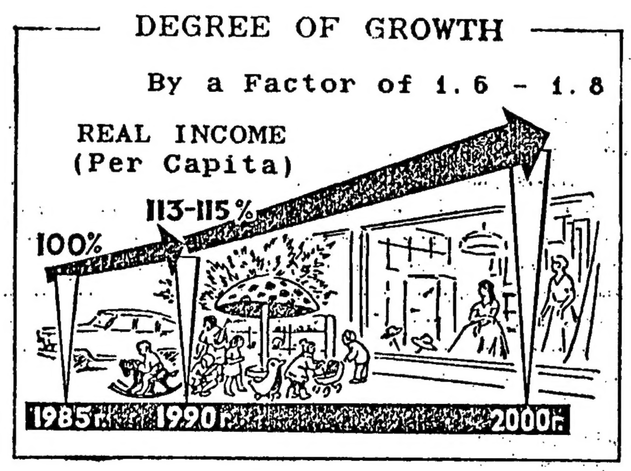
the war soon to be unleashed by fascism. The Party's concern about the country's defense was vitally necessary.

The Red Army was only 23 when it took upon itself the perfidious blow, unequalled in scope and force, of the Hitlerite armored machine. The enemy threw 190 select divisions, thousands of aircraft, tanks, and weapons into battle simultaneously. His goal was to destroy the Soviet state, wipe Moscow and Leningrad from the face of the earth, put millions of people into slavery and deprive our people of their great gains. A mortal danger hung over the Motherland. The question was this: Was the Soviet state, which opened the road to communism, to be or not to be?

At the call of the Communist Party, the entire Soviet people rose to defend the Motherland. The country was transformed into a united armed camp in an unprecedented amount of time. Having experienced the bitter taste of retreat and failure, the Red Army would strike more and more painful blows against the enemy in the future. The war lasted 1418 days and nights. In the fierce battles for Moscow, Stalingrad, Leningrad and the Caucasus, in the liberation of the Ukraine, Byelorussia, Moldavia, and the Baltic area, in the forced crossing of the Dneiper, Vistula, Oder and in the final battles for Budapest, Berlin and Prague, the Soviet Army utterly smashed the fascist horde and hoisted the Victory Banner over the Reichstag. It fulfilled its international duty also in relation to the Asian peoples oppressed by Japanese militarism.

The Second World War again showed the superiority of the economic, political and military organization of socialist society, and of Marxist-Leninist ideology. The great advantages of socialism over capitalism were successfully realized thanks to the Communist Party's wise leadership of the country, the people and the armed forces. The results of the Great Patriotic War convincingly have shown the whole world that there are no forces on earth which could defeat a people defending its own power, the workers' power, and its social system--socialism.

The greatness of our victory is immeasurable. It influenced the whole course of future world events. The world historic process of social liberation, begun by Great October, was marked by the overthrow of exploiters in a number of countries in Europe, Asia and then America after the destruction of German fascism and Japanese militarism. Socialism, which initially became a reality in our country, had become a world system.




But imperialism--responsible for two world wars which took tens of millions of lives--just cannot resign itself to the progressive changes taking place in society and threatens a third world war. In the past ten years, imperialism,

and especially American, has unleashed a frenzied arms race. Newer and newer types of monstrous weapons and military equipment are being created. The greatest achievements of human genius, science and technology have been put at the service of the moloch of war. The U.S. has spent an astronomic sum, more than 2.5 trillion dollars, on the arms race in the post-war years. The FY86 military appropriation amounts to a colossal sum--more than 300 billion dollars.

A U.S. program for strategic rearming over the next ten years has been worked out and is being implemented. In it, special attention is paid to deployment of new strategic offensive forces--MX and Midgetman intercontinental ballistic missiles, submarines with TRIDENT missiles, B-1B strategic bombers, PHANTOM aircraft of the STEALTH program, the multipurpose SHUTTLE program and air-, ground- and sea-based cruise missiles. The rebuilding of command, control, communications, and intelligence systems for combat operations in a nuclear war based on state-of-the-art technology is being accelerated. First-strike missiles have been put on combat watch in Western Europe by the Pentagon.

Of special concern is Washington's line on the militarization of space which, if you do not provide cover fire would unavoidably lead to the destabilization of the entire military-political situation and turn space into a new source of mortal danger for mankind. Even several American politicians were forced to admit this. Thus, the former head of the U.S. SALT-II delegation Warnke stated that "the `Star Wars' program is nothing other than an effective means invented by the government to kill the cause of arms control."

The names of those in the U.S. who are the instigators of militarism are known. They are chiefly the right wing conservative and reactionary circles in Washington, as well as the Pentagon, the "war hawks'" headquarters, which is directly involved in preparing the armed forces for aggressive actions. A mighty military-industrial complex stands behind them. In just 5 years the profits of the ten leading American arms manufactueres grew by a factor of 2.5.

The Soviet Union and the countries of the socialist community which are perfecting a new society naturally cannot turn a blind eye to the enormous unparallelled scope of preparations for a new world war. They are constantly concerned with creating the necessary defensive potential. As the draft of the new CPSU Program emphasizes, socialism's historic achievement was the establishment of military-strategic parity between the USSR and the USA, the Warsaw Pact and NATO. It strengthened the position of the Soviet Union, the countries of socialism and all progressive forces, and toppled the plans of imperialism's aggressive circles for a worldwide nuclear war.

A major political event of international life was the Soviet-American summit meeting in Geneva, during which the leaders of the USSR and the USA announced, in a joint document, that nuclear war must not be unleashed. The results of the Geneva talks are able to exert a positive influence toward changing the political and psychological climate in modern international relations, to improve them, and to diminish the threat of initiating a nuclear war. In a world rife with sharp contradictions, the one sensible, one acceptable

solution in the face of an impending catastrophe is peaceful coexistance between states with different social systems.

But imperialism would not be imperialism if it immediately agreed to a fundamental restructuring of international relations. It continues to cling to the past and does not want to face political reality. Ignoring the will of sovereign peoples, it is attempting to deprive them of their right to choose their path of development and is threatening their security. This is the main reason for the appearance of conflicts in various areas of the world.

In the present complicated international situation, the Party teaches us that we cannot for one moment lessen our vigilance. It is necessary to keep combat readiness at a high level, to always be on guard, to be alert. The Communist Party is always concerned that the army and navy have everything necessary for life and training, and for the execution of its constitutional duty. "The CPSU will devote all its efforts to put the USSR's armed forces on a level which precludes strategic superiority on the part of the forces of imperialism," the new draft Party Program states, "so that the defensive capacity of the Soviet State is improved across the board and that the cooperation among the armies of the fraternal socialist countries is strengthened."

Our party is doing everything necessary so that the military capacity of the Soviet Armed Forces is a solid blend of military skill, ideological stability, organization and discipline of the troops, faithfulness to their patriotic and international duty and their technical equipment.

In response to the paternal concern of the Party and the Soviet people, the soldiers of the army and navy are intensifying their efforts in combat and political studies. On the eve of the opening of the 27th CPSU Congress, on the 68th anniversary of the Soviet Armed Forces, they report to the Motherland, Party and people on the great results in the socialist competition in the units and fleet under the slogan, "We will fulfill the decisions of the 27th Congress, and reliably defend the achievements of socialism!" They successfully solve the responsible tasks assigned them for increasing combat readiness as a key index of the armed forces military might. The soldiers and sailors are tightening discipline, organization and mandated order and have achieved higher results in field, air and sea training.

There is a deep inherent sense of growing responsibility for reliable defense of the people's creative labor and securing peace on earth on the part of Soviet soldiers, especially communists, who are an example for all the personnel in study, service and discipline. This finds its expression in their desire constantly to achieve new successes in improving combat skills, to move to higher levels in study, and to celebrate the year of the 27th Party Congress with military shock work, high combat readiness and rigid military order.

Raised by the Communist Party on the glorious revolutionary, combat, and labor traditions of our people, in the spirit of Marxism-Leninism, Communist conviction, unshakable fidelity to the military oath, the soldiers of the Soviet Armed Forces hold high the glorious combat banners and carry out with

honor their constitutional duty to the people--they do everything necessary to improve the combat readiness of the troops and sailors. In a solid line with the soldiers of the armies of the Warsaw Treaty member countries, they maintain a high level of vigilance and are always ready to carry out with honor their patriotic and international duty.



9355
CSO: 1801/129

## CONDUCTING OPERATIONS USING CONVENTIONAL WEAPONS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 7-15

[Article by Lt Col V. Sidorov; "Conducting Operations Using Conventional Weapons" (Based on the views of U.S. and NATO specialists and exercise experience). Passages rendered in all capital letters printed in boldface in source]

[Text] The U.S. ruling circles, in pursuing clearly aggressive objectives, are trying to upset the military-strategic balance--the basis of international security; unleashing an arms race, primarily with nuclear weapons; developing dangerous plans to militarize space; and conducting "Star Wars."

The intensification of imperialism's aggressiveness directly influence the development of the doctrinal tenets that concern the character of and the ways in which wars are conducted. This was manifested in the U.S. military and political leadership's 1981 adoption of the strategy of "direct response" and the North Atlantic bloc's development of the coalitional military strategy of "direct response."

The fundamentally new thing about the strategy of "direct response," in contrast to the preceding strategy ("realistic deterrance"), is that it envisions the possibility of conducting a general conventional war concurrently with a nuclear one. Thus, the American leadership is trying to mislead public opinion and conceal the probable consequences of a future war and to calm down its European allies, who are afraid that their territory could become the arena for a nuclear war. Furthermore, it is trying to attain global political and strategic military objectives with minimum possible damage to the United States, which is to say it is trying free itself from nuclear retaliation.

A prerequisite to successfully conducting a general conventional war, without it escalating to a nuclear one, American specialists believe, must be for the U.S. and their allies to have available the forces and resources for armed combat that would, by their military capabilities, be surperior to similar Warsaw Treaty forces. Hence, at the present time, the U.S. and other NATO countries have taken a course not only to modernize nuclear weaponry but also to develop and to set up extensive production of the newest conventional means

for conducting war, which, in effectiveness, are slightly inferior to nuclear weapons.

Significant changes have occurred in the views of Pentagon strategists concerning the conduct of a limited war. Up until recently, a limited war in Europe was looked upon by NATO specialists as a stage in the escalation of combat activities up to the unleashing of total war. Now, the leadership of the U.S. and NATO (under the influence of implementing the American strategy), in fact, recognizes the possibility of conducting a limited war against the Warsaw Treaty states as a independent kind of warfare. This constitutes, in principle, a new posture for NATO military strategy.

However, a limited war, which starts off using conventional means of destruction, had earlier been looked upon by bloc commanders as an initial phase in a "limited" nuclear war. As such, as experience in NATO troop exercises points out, the duration of the non-nuclear period has been constantly increasing. This has become possible due to the qualitative and quantitative growth in conventional weaponry in the course of achieving the bloc's long-term military program, adopted in 1978. In keeping with this program, formations and units, in particular, have been equipped with new kinds of weapons: M1 ABRAMS, LEOPARD-2, and CHALLENGER tanks, salvo missile systems, A-10, F-15, F-16, TORNADO combat aircraft, cassette munitions, and fuel-air munitions.

State-of-the-art technology is being used to create the most advanced kinds of weapons and military technology, for example, reconnaissance and strike systems such as PLSS and ASSAULT BREAKER and other precision weapons, as well as systems that execute a wide range of C3I and electronic warfare (EW) missions. The new systems surpass previous models in range by several times, and in damage effects and precision by tens and hundreds of times, respectively. Based on data in the Western press, when fuel-air bombs explode, the quantity of energy released is almost five times more than the blast of HE bombs of the same weight. A PHANTOM aircraft, on one sortie, can destroy over 30 hectares of personnel and equipment with them and up to 100 hectares with cassette munitions.

It is not incidental that representatives of the bloc's top military and political leadership require that the governments of the nation participants pay special attention to the continued conventional arms build-up. In late 1984, the allies throughout the bloc agreed to produce jointly a new tank, an air defense missile, and a military transport plane. Development is proceeding at full speed on plans for a European fighter for the 1990s, in which Great Britain, the FRG, France, Italy and Spain are participating. In order to build up the military might of the armed forces, European NATO members have decided to purchase, in 1986, 850 tanks, primarily LEOPARD-2 and CHALLENGERS, 400 armored vehicles, and 100 artillery pieces, 850 anti-tank cannon, 250 TORNADO and F-16 aircraft, an aircraft carrier, 4 frigates, a destroyer, and several submarines, and to continue to increase anti-tank capabilities and the tactical mobility of their forces as well as provide them with more improved systems of command and communications.

Western military specialists believe that by further accomplishing their longterm military program, particularly by putting new, highly effective models of conventional arms, integrated automated systems for reconnaissance and troop and weapon control, and EW equipment into service in the NATO armies in the last half of the 1980s, the capabilities of the combined bloc forces to conduct a protracted conventional war will grow even further. According to Western military specialists' estimate, the nature of the conduct of combat operations, in conjunction with the use of the more improved means of combat, will be substantively different from wars of the past. The destructive effects of modern conventional weaponry and its great range will give a conventional war such features as target resolution, a high degree of intensity and dynamism, and a pusuit-oriented character to combat operations and their significant spatial dimensions.

Practical measures to acquire qualitatively new weapons and combat technology accompany the emergence of new concepts for conducting military operations in a future war: the American idea of the "air-land operation (battle)" and NATO's "second echelon (reserve) combat." Basically, these concepts, which in the West sometimes are referred to as "deep strike" concepts, put forward the idea of groups of forces simultaneously destroying the enemy over the entire depth of the operational-strategic formation, using the entire arsenal of available resources.

The concept of "air-land operation (battle,) which was developed and is now cited by the U.S. Army's FM-100-5 field manual (1982 edition), and, as demonstrated by experience in NATO exercises, was finally implemented by the other nations of the bloc as well. This concept, as the basic way to defeat the enemy in army corps operations and when conducting combat activities made up of formations and units, envisions the destruction of opposing groups of forces to the entire depth of his operational formation (combat formation).

Here, the depth of the zone of combat operations for a brigade is set at 15 km, for a division--70 km, and for an army corps--150 or more kilometers.

The "air-land operation (battle)" assumes coordination between maneuvering activities of first echelon large strategic formations and units and the deep fire strikes delivered by missile and artillery units, army and tactical aviation, as well as an extensive use of airborne assault forces, air mobile units, special purpose forces, and EW assets. The modern combined arms battle (battle and operation), as discussed in American manuals, must encompass two spheres: ground and air. From this follows the need to create an "air echelon," a new troop element in the operational formation (combat formation).

NATO's concept of "second echelon (reserve) fighting," approved in 1984, develops the precepts of the "air-land operation (battle)" and applies them to the strategic operation in the TVD and operations by groups of armies. It envisions simultaneously inflicting powerful strikes on the troops in the enemy's second operational echelon, and simultaneously conducting initial army corps operations in order to stop the second echelon forces from being committed to the battle in a timely fashion. In order to achieve this, it is intended that all assets available in the theater will be committed: operational and tactical missiles, medium range balistic missiles, cruise

missiles, strategic, tactical and carrier aviation, operational airborne and naval assault landing forces. The author of this concept, General B. Rogers, stated in an interview that combat in second echelons must commence when they are most vulnerable, while on the march after advancing out of their permanent stationing areas. This revelation of NATO strategy captures the very essence of this concept--inflicting a preemptive strike to the entire depth of the TVD, including the territory of the Warsaw Treaty nations, followed by a transition to the offensive of forward combined NATO groupings formed in peacetime.

In December, 1984, information appeared on the pages of the West German newspaper DIE WELT concerning the fact that, at the present time, the bloc commanders have already selected more than 1,800 sites on Warsaw Treaty countries' territory on which to inflict "deep strikes."

The development and issuance to the forces of modern models of weaponry and the acceptance of new concepts on conducting operations (battles) has demanded that adjustments be introduced into the organizational structure of units and subunits. The most characteristic one, in this regard, is the search for the optimal formation organization, which is now being introduced into the American ground forces as part of the ARMY-90 program. In examining the various division organizational variants, American commanders realized that, given the conditions of the European war theater, the most acceptable variant under modern conditions might be a fully motorized one and one that is most suitable to be an airborne formation. The first such formation, as evidenced in the American journal, MILITARY TECHNOLOGY, ought to be created by 1986. It is intended that this formation will be armed with new infantry combat vehicles, 155- and 105-mm howitzers, modern combat and transport-assault helicopters. Based on the calculations of American specialists, such a "motorized division" will not be inferior in fire power to a current mechanized division but will compare with an airborne assault division in air transportability. The ratio of combat to service subunits in the new formation is planned to reach 3:1 (in the current American infantry division it is 1.5:1). It is believed that this formation will be able to make the best use of the results of "deep fire strikes," quickly carry out a maneuvers, be inserted into the breaches made in enemy combat formations, and swiftly develop a success while operating independently, detached from one forces.

Similar changes are also intended to be implemented in the armies of the other NATO countries. For example, based on information in the British newspaper, SUNDAY TIMES, during the Autumn (1984) exercises, a new British armored tank division organizational structure was tried out. A squadron of antitank helicopters (10 LYNX helicopters) was put into the order of battle and, based upon the evaluation by foreign military specialists, it was capable of striking an "enemy" tank column 3.5 km away by launching 160 antitank guided missiles at it.

Exercises being carried out by the combined and national troops of NATO, the Western press stresses, are a good practical test of the theoretical principles of the offensive concepts. Thus, in the FLINKER IGEL [Wiley Hedgehog] exercises of the Bundeswehr's II Army Corps, an offensive was developed from west to east with "deep penetration" into the territory of the

neighboring state. The FRG Minister of Defense, M. Werner, who was present at the exercise site, stressed that aircraft delivered strikes on a "massing of `enemy' troops deep within his [the enemy's] territory." This exercise took place in the southern regions of the FRG (in Bavaria), which is directly contiguous to the Czechoslovak border. Among the participants (55,000 persons), besides the West German troops, there were American and Canadian formations and units.

Active offensive operations were also played out in another exercise: SPEAR POINT-84. Besides the three British armored divisions permanently stationed in the FRG, reinforcement troops brought into West Germany from Great Britain, as well as formations and units from the American, West German and Dutch armed forces (over 130,000 servicemen), took part.

This was the largest operation to bring together NATO troops since the Second World War. The whole exercise took place only ten kilometers from the GDR border.

Based on an announcement by the official representatives of bloc nations, their armed forces already now have an adequate technical base to realize the new concepts. However, Western theoreticians believe that in order to achieve guaranteed success in war against the countries of the socialist fraternity, the bloc commanders must be the first to use nuclear weapons. The possibility of successfully executing operational missions by inflicting "deep strikes" using only conventional means is linked to the realization of NATO's long-term military program, and, first and foremost, the mass equipping of troops with precision, long-range weaponry like the ASSAULT BREAKER, PLSS, and others, as well as having highly trained staffs and formations to conduct combat activities under new conditions.

The experience of large-scale exercises conducted by the U.S. and combined NATO armed forces in recent years shows that the basic way in which the concepts are strategically applied, both in the European as well as other theaters of military operation (TVD), is through strategic operations planned and carried out by the TVD high command.

Based on calculations by the NATO leadership, the political objectives of a limited war in Europe can be achieved while successfully conducting the initial strategic operation, primarily in the Central European TVD, which is the main theater of military operations in Europe; operations with the combined services of the armed forces along separate strategic (operational) axes of other European TVDs and also naval operations in the Atlantic. A general conventional war is perceived as an opportunity to conduct several strategic operations in the Central European TVD.

In order to prepare for and conduct such operations while still at peace, a high command for the combined NATO forces in the Central European TVD has been created, which has the Northern and Central Army Groups assigned to them along with the 2nd and 4th Allied Tactical Air Forces (ATAF)1. These forces and equipment should constitute the first operational echelon of the NATO forces. It is planned for a high command reserve to be created during the strategic deployment on the eve of or during the war.

To support the successful conduct of initial operations while still at peace, the operational equipment of the Central European TVD is being improved. In foreign military specialists' opinion, the extensive road network makes it possible to select a large number of frontal and parallel routes in any direction. NATO specialists have designated more than ten primary frontal routes within the borders of this TVD. Roads that run parallel to the front are also well developed, particularly the major highways, which allow one to make quick maneuvers. This will permit armed forces strike groups to be reinforced in a short time either on the eve or during the course of military operations.

The organs to strategically and operationally control the combined armed forces of the North Atlantic bloc are in constant readiness to assume the leadership of NATO member nations' national troops (forces) which become subordinate to them. A system of fixed and mobile command centers have been set up for this purpose (a Supreme High Command for the theater combined NATO forces, high commands for the TVDs, and commanders of the armed forces services' operational large formations) A unified communications system is on listening watch and is based on satellite, tropospheric and radio relay lines.

In order to supply protracted military operations, the armed forces of the NATO countries have created large supplies of munitions, POL, food and military technical property. At the present time, a portion of these items are already housed in field depots directly in the border areas. The U.S. and NATO leadearship are undertaking measures to further increase these supplies.

The presence of a powerful grouping of armed forces present in the Central European TVD that is capable of executing offensive missions has been recognized by the leaders of the USA and NATO themselves. In an interview in the West German newspaper, DIE WELT AM SONNTAG, in 1982, the U.S. secretary of Defense, C. Weinberger, pointed out that the NATO countries "have significant strike forces at their disposal in Central Europe."

The scope of a strategic operation depends upon the diversity of the nature and scale of and coordination among operations, battles, strikes, and combat acativities in the large and smaller formations of the various armed forces services. In conventional war situations, the most important factors are considered to be massed strikes by precision weaponry, air operations, offensive and defensive operations by army groups, and air and naval assault landing operations.

The U.S. and NATO commands do not divide strategic operations into offensive and defensive operations. It is believed that under conditions which are unfavorable for the North Atlantic Alliance, a strategic operation in a TVD might begin by conducting defensive activities on a tactical and operational scale, but rule out turning it into a strategic defense. In keeping with this, recently, the questions of conducting combat activities to support a strategic line on the Rhine River, as envisioned earlier, are not examined at all and the permissible depth of the enemy driving a wedge into NATO defenses, based on exercises, does not exceed 50-70 kilometers.

The underlying reason for this approach is obvious. West German political and military figures announced back in the early 1970s, that for them "any strategy that allowed the possibility of losing FRG territory is unacceptable." They persist in adopting the concept of "forward perimeters," which is an important component part of the bloc's coalitional military strategy. At the present time, once again under the influence of the West German militarists, and wholeheartedly encouraged by their American partners, the so-called "forward defense" has been transformed into an offensive from forward perimeters.

Experience in the operational and combat training of combined NATO forces is witness to the fact that the bloc's command consider the army group operation to be the basic form of operational employment of ground forces in the Central European TVD, and operations by commands of combined ground forces in the detached regions (zones) of the flanking TVDs. Depending upon their objectives and the nature of the missions to be executed, the operations can be either offensive of defensive.

An offensive operation by an army group is intended to be carried out to destroy the enemy's first echelon and capture important economic regions and administrative and political centers on the territory of one or more Eastern European socialist countries. Such an operation may be characterized by the following indicators of scope: depth--300-500 km, width--250-400 km, length of time--6-10 days, average rate of the advance--up to 50 km/day.

Depending upon how imperialism unleashes its war, an army group may go on the offensive as a smaller peacetime grouping with minimum reinforcements (up to 15 divisions) or may begin the operation after a full deployment (25 or more divisions). While still during peacetime, the formations and units of the Northern (NORTHAG) and Central (CENTAG) Army Groups are stationed in close proximity to their designated operational regions. This will assure the rapid formation of troop battle groups along selected axes to inflict the main strikes.

In the NORTHAG zone, foreign specialists have singled out the Berlin axis. It is precisely here in the course of exercises that the most combat-ready formations of the First West German and First British Army Corps are deployed. Along this same axis, the Third American Army Corps has also been assigned, which, from exercise experience in recent years, is made up of reinforcement troops brought over from the U.S. Thus, the NORTHAG commanders are considering allocating more than 70 per cent of their forces and equipment deployed here along the main strike axis.

In the CENTAG zone a Leipzig axis has been selected. In Exercises the make up of the troop battle groupings include formations of the 3rd West German, and 5th and 7th U.S. Army Corps (also about 70 per cent of the forces and equipment of the army groups.)

The operational formation of army groups on the offensive is usually set up in two echelons. However, as a rule, the second echelon is formed right during the operation from formations that constitute the army group commander's reserve and personnel transferred from the TVD's high command reserve.

The rapid massing of forces and materiel in an offensive operation will be achieved by high mobility in troops and weapon systems. The decisive factor for success in an offensive, as required by American regulations, must be the creation of a six-fold advantage in men and materiel in narrow sectors of the breakthrough. In order to achieve such superiority, the NATO command plans, first of all, the mass employment of the first echelon army corps primary firepower and a major portion of the ATAFs tactical support aircraft, in these sections.

It is anticipated that highly maneuverable command units and subunits will be put into the breach formed in the enemy's defenses as a result of the effects of fire. They will try to develop the offensive, with wide use being made of air assault troops and airborne assault landings. The main backstop will not be in making an early concentration of men and materiel in front of sectors of the breakthrough, as it was in the past. but in gaining superiority by destroying the enemy with fire and attempting to maneuver the troops along the front lines and in depth. The NATO command believes that given the increase of the depth of the simultaneous fire damage to the enemy and the increase in air mobility of one's own forces, the offensive capabilities of the combined bloc forces will constantly grow.

A defensive army group operation may have a place both at the beginning of a strategic operation in the TVD as well as in the course of carrying it out. Foreign military specialists point out that recently, the NATO command is giving the defense more decisive objectives than was true in the recent past. It has demanded that the defenders not only break through and stop the enemy offensive, but also inflict decisive damage upon him, thereby creating the most favorable conditions to transition one's own forces over into a counteroffensive.

As a rule, during recent NATO exercises, an army group has begun a defensive operation as a peacetime battle grouping with insignificant reinforcements. Nevertheless, the penetration of an attacking enemy does not exceed 50-70 km in the Central European TVD, i.e., he was not able to break through even the forward edge. Furthermore, NATO troops in the course of 6-7 days "inflicted damage and finally stopped the "enemy offensive."

In organizing the defense, as in an offensive operation, great attention is paid to "deep strikes." Based on evidence from the foreign military press, precisely the ability of NATO to inflict simultaneous fire damage on the enemy at a great depth predetermined in exercises what targets the commanders of the combined bloc forces decide to assign their troops.

Air offensive and defensive operations are the primary forms in which formations of the NATO air forces are employed in a conventional war.

As experience in the yearly NATO air forces' exercises such as CENTRAL ENTERPRISE and COLD FIRE shows, during an air offensive operation, tactical aviation executes the following basic missions: it gains air superiority; it breaks up enemy troop control; it inflicts damage on the enemy's deep reserves, and disrupts his communications. During an air offensive operation, at the present time, the majority of missions are accomplished in accordance

with the American concept of "air-land operations (battle)" and NATO's "combatting the enemy's second echelons (reserves)." This first and foremost involves inflicting damage on enemy second echelon formations, disrupting their advance and entrance into action.

Depending upon the conditions for conducting a strategic operation in the TVD and the scope of missions to be executed, an air offensive operation, based on exercise experience, may last one to three days. Up to 80 per cent of all combat-ready aircraft in the NATO air forces' formations in the TVD are committed to participate in the operation.

The basic way in which an air offensive operation is conducted is through massed air strikes, during the course of which a majority of tactical aviation inflicts strikes, according to an agreed-upon single plan, on enemy nuclear missile weaponry and aircraft at airfields, troop control points, communications nodes, and advancing second echelons (reserves), i.e., it acts in support of the entire strategic formation. Simultaneously, a portion of the aircraft is used to offer direct air support to first echelon attacking formations in accordance with the army corps commander's plans. The majority of tactical aviation's air resources are allocated to perform this mission in the intervals between massed air strikes,

The defensive air operation, in the views of NATO commanders, will be carried out to repulse the enemy's massed air strikes and cover the main groupings of their own troops (forces), important military, economic, political and administrative centers in the TVD. The possibility of conducting such operations is determined by the same organizational structure of the bloc's combined air forces in the theaters of military operations, including the centralization of control of both tactical aviation as well as the men and materiel of the air defenses (subordinated to a single commander). Specifically, in the Central European TVD, the air forces commander is, at the same time, the Central Air Defense Zone commander, and the commanders of the 2nd and 4th ATAFs are the commanders of the corresponding air defense zones. In the opinion of the bloc's military and political leadership, the combining of these duties makes it possible flexibly to redirect tactical aviation to execute both offensive and defensive missions, while assuring mutual cooperation between aviation and the ground air defense assets and their control while conducting various kinds of combat operations.

Foreign specilists believe that those who can be called upon to participate fully in a defense air operation in the Central European TVD are: The combined air defense system's Central and Atlantic zones' manpower and resources; French, Spanish, and Portuguese national air defense systems; Northern and Central Army groups air defense, as well as tactical aviation in the 2nd and 4th ATAFs and the command of the Royal Air Force in Great Britain.

During a defensive air operation in the TVD, the Western press reports, the combined air forces command will try to execute the following missions: using radar, including AWACS command and control aircraft, try to determine, early on, the air enemy's intentions; determine the axes of his aviation's massed strikes; and by closely coordinated operations of all the manpower and resources allocated to the operation, destroy targets detected at all

altitudes and speeds, concentrating one's primary efforts on covering the main troop (force) groupings and important military, economic, administrative, and political objectives. In order for this to be done, all air defense forces and resources available in the TVD will have to be dedicated. In the forward regions, the primary missions are more frequently accomplished by the IMPROVED HAWK air defense guided missiles and the troop air defense assets attached to the army group. In the rear, NIKE-HERCULES air defense guided missiles are used along with fighter aviation and air defense equipment which cover basing airfields and rear facilities. The PATRIOT air defense guided missiles, which is currently being put into service, will also be used to carry out these missions.

An analysis of the large NATO command-staff and operational exercises dealing with questions of employing combined-naval forces, shows that during a strategic operation in the TVD, the nature and sequence of executing missions in the European theater of war internal and coastal seas can be as follows.

Initially, in conducting the first combined naval operations, the NATO command intends to achieve superiority in the Norwegian, North, and Mediterranean Seas and also in the Baltic. To execute these missions, it is planned, based on exercises, that a maximum number of combat-ready naval forces will be committed. Military specialists believe that NATO's carrier strike forces, the basis of which are the U.S.'s multipurpose aircraft carriers, which, even in peacetime, perform military duty in the Eastern Atlantic and the Mediterranean Sea, must play a decisive role in defeating groupings of enemy ships, and destroying his systems of control, supply, and basing.

Depending upon whether superiority is won at sea, a portion of various kinds of naval forces can be reassigned to protect sea lines of communications and carrier strike forces can begin direct support of amphibious assault landing forces and ground forces fighting on maritime axes. Based on experience in NATO exercises, multipurpose carrier groups of NATO's strike fleet in the Atlantic, when accomplishing these missions, have occupied combat maneuver regions in the Norwegian and North Seas, the Bay of Biscay, and the naval strike forces in the Southern European TVD--in the Createan, Ionian, and Tyrrhenian Seas.

Hence, the direction of the military build-up and experience in operational and combat training for the U.S. and combined NATO armed forces are witness to the strengthening of efforts to prepare for both a nuclear and a conventional war with the USSR and its allies in the Warsaw Treaty. In the course of fulfilling its projected program to improve conventional armaments, the threat of the imperialists unleashing a conventional war by surprise will continually grow.

Given these conditions, the CPSU has called upon the Soviet Armed Forces vigilantly to maintain the gains of socialism. "The growing military threat on the part of the United States and their allies in NATO," as stated in the CPSU CC resolution entitled, "40th Anniversary of the Soviet People's Victory in the Great Patriotic War, 1941-1945...demand that our homeland constantly strengthen its defense capability, and the military might of the Soviet Armed Forces."

1. For more details on this, see: FOREIGN MILITARY REVIEW, 1985,

No. 12, pp. 7-15. Editor.



9355
CSO: 1801/129

SUPPLYING POL FOR FORCES' COMBAT OPERATIONS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 1986) pp 25-29

[Article by Col I. Danilchenko; "Supplying POL for Forces' Combat Operations"]

[Text] The Reagan administration's declared "crusade" against the Soviet Union and the other socialist states, as well as the effort by world imperialism to suppress national liberation movements, definitely influences the policy of leading circles in the aggressive NATO bloc, in particular, in training and equipping its armed forces. Under the guise of the thoroughly false slogan of the "Soviet military threat," an intensive effort is underway to improve the organization of formations, units, and subunits in the plan to strengthen their armed might, to increase their strategic mobility, and to create a flexible organizational and staff structure in order to carry out combat operations in various regions of the globe.

A component element of these large-scale measures is the further improvement of the materiel and technical services (MTS) organization, the chief objective of which, as indicated in the basic documents of foreign armies, is the complete and multilateral support of troop combat activities. In evaluating the outlook for the development of MTS resources to the year 2000, foreign specialists note that the army should always be improved constantly and have mastered the most modern technology in order to be victorious in any battle. However, modernizing only weapons systems, in their opinion, is not enough. A flexible and highly effective rear structure is also necessary, which, under modern conditions, demands the following: achieving coordination in developing assets to conduct armed combat and perform MTS; creating a rear structure which meets the demands of the armed forces in peace--as well as wartime; rapid mobilization and deployment of rear units and subunits; introducing into the rear services system the most modern and promising developments in the military and commercial fields; and accumulating adequate resources ahead of time in the event of war.

In the effort to make the MTS system most completely conform to the inquiries and requirements of the troops, foreign experts in this field have been generalizing experience from armed conflicts since the Second World War. From this perspective, military activities by the U.S. armed forces in Korea and Vietnam and the armed conflict between Great Britain and Argentina in March to

June, 1982, are being evaluated. A significant part of this research has been devoted to analyzing the organization of troop POL supplies and the effectiveness of using existing, in-service technical assets, seeking ways to implement the MTS system quickly into action during combat conditions, and finding more specific ways to utilize commercial equipment and MTS assets, as well as other issues.

In stressing the importance of the timely and complete supplying of troops with fuel during the successful conduct of combat operations, foreign military specialists asknowledge the following facts. The average number of vehicles in a mechanized (armored) division is about 3,000 units, with total formation load capacity of 11,000 t. In order to complete a 100 km march, it takes 90-100 t of fuel, with M113 armored personnel carriers and M60 tanks needing more than 150 t. This figure can increase to 200 t when the division is made up of M1 ABRAMS tanks instead of M60 series tanks. If you take under consideration the requirements for fuel by division artillery and army aviation (20 combat helicopters expend up to 120 t of POL per day), engineering equipment, electric power stations, field kitchens, etc., as the foreign press reports, the daily division expenditure of POL supplies can reach as much as 660 t in the defense and up to 820 t on the defense. Proceeding from this, the supply of POL to a division, for example, must need up to 200 4-ton vehicles, which, combined with the need to transport other MTS supplies, creates substantial difficulties in supplying troops with POL. It has been noted that an identical situation can be observed during the supply of an army corps, since the daily requirements for just the forward units of a single corps is about 2,000 t POL. The view has been expressed that the probable enemy, with the Soviet Union being expressly cited, will make every effort to block the delivery of fuel from its storage area to the troop combat formations. The system of POL supply should be flexible enough to be able to accomplish its task even when the possibility of using local resources is impeded or cannot be accomplished at all. In particular, such a situation, British military specialists assert, occurred during combat operations on the Falkland (Malvinas) Islands.

Many American military specialists have identified overseas territories as theaters of operations for future wars. The problems of supplying troops with fuel involves resolving the following issues: delivery of POL, supplying fuel to formations and units, organizing the refueling of combat equipment, and using technical equipment most efficiently, and other issues.

As reported in the Western press, at the present time, POL supplies in the combined NATO armed forces in Europe are calculated to be enough for one month of combat operations, and for the U.S. Armed Forces--for two months. Further on, it is planned to increase them to meet a 3-month requirement. In the event combat activities commence, it is intended that about 12 million tons of petroleum products, using the main tanker fleets of the U.S., the U.K. and Canada, will be sent from the U.S. mainland to Europe. Experience in transshipping large amounts of fuel over substantial distances was obtained by the British command during the Anglo-Argentine armed conflict in the South Atlantic over the Falkland (Malvinas) Islands.

Judging from reports in the British press, the expeditionary forces contained over 40 combat vessels (including 2 anti-submarine aircraft carriers, 4 submarines, 9 missile-carrying destroyers, as many as 20 frigates, mine sweepers, amphibious landing and other ships), more than 40 HARRIER aircraft, about 200 army aviation helicopters, light tanks, armored personnel carriers, artillery prime movers, automobiles and trucks and other equipment. The difficulty in supplying them with fuel lay in the fact that it was necessary to supply them with a deployment range of 15,000 km, hence, the naval auxiliary ships (23 units) included 10 tankers. Inasmuch as these assets turned out to be inadequate, the British command decided to use the experience of the U.S. in organizing the MTS for the "Rapid Deployment Forces," that is, to enlist commercial ships. To this end, 45 cargo and passenger ships were chartered and requisitioned, including 15 tankers.

Fuel delivery also occurred using other resources. Six VULCAN bombers and seven C-130 HERCULES military transport aircraft were reoutfitted and turned into tanker aircraft. The importance which British military specialists have attached to supplying the expeditionary forces is evident in the official Ministry of Defense report on the results of conducting military operations in the Falklands (Malvinas) Islands. It notes, in particular, that of the total expenditures for preparing the expeditionary forces, which exceeded 200 million pounds sterling, a significant portion represented expenditures for supplying troops with the necessary POL materials.1 In order to accomplish these tasks, commercial container vessels were also used that could deliver fuel in soft storage containers2 inserted into standard steel and dispensing containers. The foreign press reported that this method turned out to be quite effective. This is especially suitable when a container ship, after a proper conversion, can be equipped with artillery and air defense weaponry, have a landing and take-off platform for HARRIER aircraft and helicopters built onto it, and undertake other measures to assure its safety while in transit.

In analyzing the experience of the Anglo-Argentine conflict, Western specialists have not come to the same opinion concerning the issue of using such items as soft floating storage containers (DRAKON-type barges) towed behind ships (there are known to be containers with capacities of 397,470 and 1,100,130 liters) to deliver fuel by sea over long distances. On one hand, it is believed that with such containers, fuel can not only be delivered, but can also be stored in coastal waters.

Furthermore, experience in using them up until now has been quite limited and their use by the Americans in Vietnam pointed out how vulnerable floating containers are and the increased danger they pose to navigation in the coastal zone.

There is a distinct difficulty in transferring delivered fuel to the coast or a captured beachhead. If fuel is delivered to a region of combat operations by tankers and reservoir barges, it is assumed that a set of special equipment will be used for this purpose, including tanks to store the fuel, light floating or steel pipes, pumping equipment, etc.
The foreign press reports that during the Anglo-Argentine armed conflict, fuel from container vessels was transferred to shore using assault landing

equipment, helicopters, and other equipment. Specialists on the rear have given high marks to the LYNX and SEA KING helicopters, which have an adequate load capacity when the load to be delivered is distributed in the cabins and an external sling. In evaluating the results of the activities of the Argentine planes in barring the approach of POL ships into the area of combat operations and its transfer ashore (one container vessel was sunk and two auxiliary vessels were damaged), British experts point to the need for more reliable cover for auxiliary vessels on naval lines of communication, particularly in anchorage and in transloading areas.

In accordance with the view taken by NATO. POL materials can be stored in fixed, semi-fixed, or field depots, depending upon the level of equipment in the theater of combat operations. From there the depots can be fed from formation and unit rear areas via fixed and field pipeline, river, rail, and vehicular transport. At the present time, Central Europe alone has a branching network of pipelines with a total length of about 6,000 km. More than 100 pumping stations have been set up on the network, and the lines are connected to more than 50 storage and depot facilities, with a total capacity of about 1.5 million cubic meters. This network is tied to approximately 30 petroleum refineries.

The effort to maximally facilitate a means of storage that can be used to put together fuel dumps has been manifested in the majority of foreign armies making ever wider use of rubberized fabric storage containers. Thus, the press reports that British ground forces, when deploying fuel dumps and forward storage areas (the latter are deployed in the rear areas of the combat units), prefers to use storage containers made by the firm of Marston, which have a capacity of 45,000 and 136,000 liters. In the U.S. Army, containers of 37,000 and 189,000 liters are most widely used. The French firm of Pronal et Cleber produces containers with capacities running from 40,000 to 135,000 liters. Foreign specialists rank such containers quite highly because of their small size (they take up 135-136 cubic meters and weigh 500-600 kg), their small size when folded up (about 3 m3), and the ability to use them (when filled to no more than 35,000 to 40,000 liters) for shipping on various kinds of transport. Furthermore, they respond to the need to remain operational due to their reduced vulnerability to rifle fire and fragments, to improvements in their reparability, and to a widening of their operational temperature range.

The foreign press reports that the delivery of POL from storage points and directly refueling combat vehicles are the most important stages in troop fuel supply. To meet these objectives, it is intended for pipelines, tank trucks and rubberized cloth storage containiers, cannisters, etc. to be used.3 The British ground forces have made the most use of 2,100 liter containers, which are transported about on special vehicles. A refueling unit, which can be dismantled, (which weighs about 1,830 kg) is transported along with the containers. It is made by the firm of Glouster Sarrow and includes a diesel engine, a pump that can deliver 228 l/min, a filter separator, a 32-m long hose that dispenses evenly, and 6 dispensing nozzles. The Marston firm has

developed a lighter type of container for the ground forces that can hold 750 liters of fuel.

Foreign military specialists have quite favorably rated soft, rollable containers that hold 1,890 liters. Such containers when empty are only 15 per cent the size of their full state. This facilitates transportability, particularly during return trips when it is necessary to evacuate the wounded, damaged equipment, etc. When it is filled with fuel, it can be transported on any kind of transport equipment, for example, suspended on a suspended helicopter sling, towed on water, rolled on land, towed behind a vehicle for small distances overland at a speed of 18 km/hr, thrown off a vehicle and dropped from small heights without parachutes. On account of using such containers in the armies of the U.S., Britain and France, commensurate vehicular refuelers have been created (two or three containers and a refueling unit mounted on a vehicle) along with field refueling points (the same equipment but assembled on the ground).

Deficiencies which have been identified regarding these containers include their relatively high cost and comparatively short service life (about 15 use cycles), as well as their unsatisfactory operational temperature range, particularly in areas with low temperatures (no lower than -70 C). Specialists note that the French-made containers are characterized by good stability when transported on external slings on helicopters; however, because of peculiarities in design, they are unsuitable for handling in ground operations. Along with the various containers and storage tanks in the armies of many capitalist countries, fuel supply vehicles and tank trucks are also widely used.

The combat activities in the Falkland (Malvinas) Islands showed that to deliver fuel ashore and refuel combat equipment, the British made wide use of common cannisters, which, in the opinion of Western specialists, remain an integral element of the troop fuel supply system. Deficiencies, such as the great expenditure of labor involved in filling them and returning them, the significant amount of manual activity, the tiring of the personnel, etc., in their opinion, is compensated by a number of advantages: the maximal dispersion of the scope of refueling operations, the availability of immediate fuel supplies for each vehicle, the possibility of delivering fuel to regions with difficult access.

In studying the experience in conducting combat operations in the post-war period and from exercises at different levels, as well as in analyzing the results of the Anglo-Argentine armed conflict, foreign military specialists in the POL field stress the fact that the delivery of large quantities of POL using conventional means (along pipelines, tankers, large tonnage tank trucks, storage containers, railway tank cars, etc.) is completely justified. It is considered that insofar as getting fuel close to the consumer is concerned, a certain portion of it should be shipped for delivery in packaged form (cannisters, small storage containers, and in tanks), but the ways in which

the fuel is brought forward and the means of storage should be properly safeguarded.

1. The total expenditures by Great Britain for the conflict amounted to 2.5 billion pounds sterling. Ed.

2. The "Portolite" type container, intended to be filled, is placed on the bottom of the steel container, pulled up the container and fastened down with straps. Then the reservoir-connecting pipe is connected to the hose which pumps fuel or another liquid. After it is filled to the allocated level, the straps are tightened to the proper strength to pull on the soft storage container and keep it properly in place in the hard container. In this way, it can be transported for any distance using vehicular, railway, and water transportation.

3. For more details on the equipment used for troop fuel supply, see: FOREIGN MILITARY REVIEW, 1981, No. 6, pp. 39-42 and 1884, No. 10, pp. 38-42. Ed.



9355
CSO: 1801/129

# FRENCH AUTOMATED FIELD ARTILLERY FIRE CONTROL SYSTEMS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 35-38

[Article by Col B. Dmitriev; "French Automated Field Artillery Fire Control Systems "]

[Text] In order to increase the combat capabilities of formations and units in the French ground forces, measures are being taken to equip them with new models of weapons and military technology. Thus, in the early 1980s, the new ATILA-2 and the ATIBA automated control systems (ACS), for firing field artillery, were developed. They are expected to be used as part of tube as well as missile artillery.

The ATILA-2 ACS (an improved variant of the ATILA system already in service in the ground forces) is intended to be used at the "battery-regiment (battalion)" level. In foreign military specialists' opinion, it has such positive features as: a quite short reaction time (from the receipt of intelligence data to the issuance of the command to open fire), good survivability under counterbattery fire conditions, flexibility of control in a rapidly changing tactical situation, efficiency and constant readiness for use in combat. Furthermore, the system is characterized by good communications security, thanks to the use of digital methods of transmitting data, simplicity of technical servicing due to having built-in devices for automated control and a high level of standardization achieved by using a structure of changeable modules.

The variants of the ATILA-2 ASCs for the battery and regiments levels have a lot of common components and differ from one another by the number of devices being used, the volume of data being processed, and the number of artillery subunits being served (Fig. 1),

The primary sources for receiving intelligence data needed by the ATILA-2 system are artillery instrumental reconnaissance subunits, which include, in particular, forward artillery observers, reconnaissance vehicles equipped with the appropriate device, and the SCIROCCO automated weather reconnaissance system.

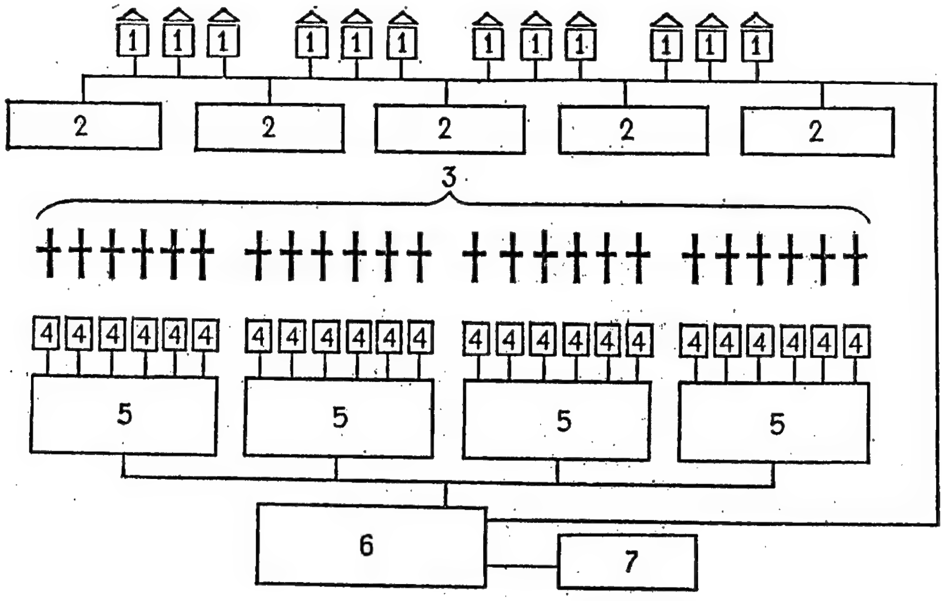



Figure 1. ATILA-2 ACS Structural Diagram

1. Artillery Observers.
2. RATAC Radar.
3. Batteries.
4. Control Display Units.
5. Battery Command Post.
6. Regiment Command Post.
7. Automated Weather Reconnaissance System.

At the forward artillery observers' disposal is a special TRC-743 console for entering data. It is linked to the portable TRC-559 ultrashortwave radio set that works on the 30-80 MHz frequency range and has an operating range of up to 10 km. The dimensions of the console are 300 x 100 x 80 mm and it weighs 2.2 kg. Transmission to the battery or regiment command post of data entered into the console is done in coded form.

The ATILA-2 ACS equipment, located in the artillery regiment command post (mounted in an armored vehicle) ties into a central computer which has a video screen (display screen) which displays received information and processed data. The machine produces data on fire control for up to four batteries (each containing eight cannon). The computer can simultaneously process data for eight targets (two per battery), and the information it produces contains the initial conditions for firing, adjustable fuse settings, the types of munitions and charges, and also the kind of artillery fire and designated expenditure of munitions. Three weather bulletins (standard weather conditions, current and forecasted weather data), the coordinates of 30 forward artillery observers, 8 batteries, 100 targets, 20 reference points, and 35 areas not to be fired upon and for mutual fire support, and also up to 240 projectile velocity rates (when fired from each piece using various types of charges) can be entered into the memory of the computer to do calculations.

The output firing data processed by the central computer is automatically transmitted to the control display unit located at each cannon in the battery

and which, in turn, makes is possible for the central computer to control the expenditure of projectiles and charges without interruption. The unit is linked to the fire control center by radio or wire communications lines. The data displayed on it for the gunner of the cannon's crew contains the calculated setting for the sight, the kind of projectiles and charges to use, the type of and setting for the fuse, the amount of munitions allocated to execute a given combat mission, and the rate of fire. Simultaneously, using a control display unit, data such as the cannon's combat readiness, the number of spent projectiles and the current coordinates of the firing position are entered into the central computer.

The battery fire control system, which may be linked to a regiment command post (for centralized control) or be used independently, also contains a central computer, but with smaller dimensions than the video monitor. When used independently, the ATILA-2 can be used to control the fire of a battery containing 8 cannon, receive data from 10 forward artillery observers, and register the cordinates of the firing positions of 16 cannon, 10 forward artillery observers, 50 targets, 10 reference points, and 10 interdiction sectors or fire concentrations, as well as determine the rates of up to 60 projectile velocities.

As noted in the foreign press, with an ATILLA-2 system in the command post of batteries and a regiment, both operational information on subordinate artillery subunits (the locations of batteries, the combat readiness of each piece, expended and available ammunition) as well as generalized information on the enemy (the nature and type of targets and their coordinates) are constantly being received. This makes for rather quick decision-making, control over the use of the units and operational management of combat operations. Orders on the organization for the conduct of fire are transmitted down to subordinate suubunits and crews completely automatically. Base on reports from the foreign press, by using an ATILLA-2 ACS, the firing accuracy of each artillery piece aimed at a designated target is 0.3 mil in azimuth and 13 m in range. Likewise, the shortest possible reaction time which the system provides at the regiment and battery levels is 35 and 15 seconds, respectively.

Besides the forward artillery observers, intelligence data is put into the ATILLA-2 ACS from AMX-10 combat reconnaissance vehicles equipped with RATAC ground target reconnaissance radar. This radar allows one to conduct reconnaissance around the clock in any weather conditions and to detect moving ground targets up to 20 km away. They also allow one to adjust fire by [radar] fixing and to determine the coordinates of the explosions of artillry projectiles where the firing is being conducted by one's own subunits. The portable RASIT-72 ground reconnaissance radar has approximately the same capabilities.

Information the ACS has on the enemy obtained from reconnaissance planes, helicopters, and drones may be used in the ACS. The MIRADOP device, which is based on special doppler-effect radar, measures the velocities of the projectile being used in the calculations while the cannon are firing.

Weather data (wind speed and direction, air temperature, pressure and humidity), which are important in making calculations, are received in the fire control system's central computer in the form of weather bulletins from the automated SCIROCCO weather reconnaissance system, which is based on weather radar and a complement of meteorological sounding balloons. The formatted weather bulletins are transmitted over wire communication lines or a troop TR-TV-213 ultrashort wave radio set operating in the 26-72 MHz frequency range and has a range of up to 30 km.

Foreign specialists have noted that one of the distinguishing features of the operation of the French ATILA-2 ACS, in comparison to other similar devices used in the armies of other leading capitalist states, is the use of the NSM-20 automated navigational device, installed on self-propelled artillery mounts, in particular, the F1 155-mm self-propelled gun. With the assistance of the ATILA-2 computer system, it allows one to keep constant track of the current coordinates of each piece and to prepare the output data for firing while the ordnance are breaking out into designated firing positions.

The ATIBA ACS is intended to provide fire support in artillery subunits with a reduced number of ordnance or which break out into highly mobile troop formations, for example, as Rapid Deployment Forces. The foreign press points out an excellent feature of the ACS: the ability to use it in any organic organization of artillery subunits and its deployment on various kinds of combat vehicles.

The ATIBA ACS, which uses several components from the ATILA-2 system, makes it possible to control, automatically, the fire of batteries containing up to 8 cannon, even when firing at moving targets. Its reaction time is no less than 15 seconds. Reconnaissance data in this system comes from forward artillery observers linked by radio to the battery command post.

The ATIBA system, (Fig. 5) located in the battery command post is equipped with a computer to make appropriate calculations and a radio set to communicate with forward artillery observers. The display

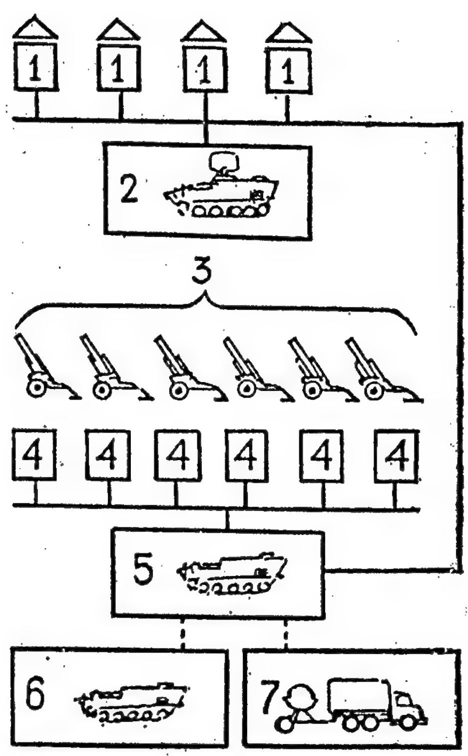



Figure 5. ATIBA ACS Structural Diagram. 1. Forward Artillery Oservers; 2. RATAC radar; 3. Battery Ordnance; 4. Control Display Unit; 5. Battery Command Post; Regiment (Arty Battalion) Command Post; 7. SCIROCCO Automated Weather Reconnassance System.

screen shows received data which are used to decide how the artillery is to be used. The artillery calculations that lead up to a decision are done on control display units, similar to the one in the ATILLA-2 ACS. The memory of the ATIBA system's computer can store data on a maximum or 100 targets received from 10 forward artilley observers.

In French military specialists' opinion, putting both types of ACSs into service in the ground forces has substantially increased the combat readiness of field artillery subunits, the precision, and, correspondingly, the effectiveness of conducting fire, as well as decreased the effects of meteorological conditions in the completion of assigned tasks.



9355
CSO: 1801/129

# INCREASING COMPLEXITY OF PILOT OPERATIONS IN COMBAT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 39-46

[Article by Col R. Grachev, Candidate of Military Sciences; "The Pilot in Combat Flight." Passages rendered in all capital letters printed in boldface in source]

[Text] During the active militaristic preparations, being carried out by right-wing circles of the U.S. and other imperialistic governments, a great deal of attention is being paid to research concerning the activities of man on the field of combat, specifically, the activities of a pilot during a combat flight, and, on the basis of this, to the improvement of pilot-navigation and other equipment supporting a more effective execution of his assigned missions.

Foreign military specialists unanimously note that each flight is saturated with complex elements and includes several phases, in the process of completion of which the pilot's (crew's) actions have their own peculiarities and are distinguished by content. For example, the flight of a fighter is divided into the following phases: the search for the target, the maneuver to get into a favorable position, the approach, the attack, and the break out from combat under the protection of its own PVO. A bomber must negotiate the enemy PVO systems' detection, tracking and fire zones in order to complete various maneuvers, to use weapons on the target, to break out from the attack and to complete the difficult return trip. Reconnaissance, ground attack, and fighter-bomber aircraft combat mission flighte are no less saturated and complex.

In studying the experience of past wars and armed conflicts, Western specialists have identified the principal trends, which characterize the qualitative and quantitative aspects of a pilot's activities during a combat flight, namely: the increase in the number of operations from aircraft and weapons control elements; the reduction in efficiency during the most complex phases of flight; an increase in the flow of information, subject to processing (analysis); and the shortening of decision-making time.

THE GROWTH IN THE NUMBER OF OPERATIONS FROM AIRCRAFT AND WEAPON CONTROL ELEMENTS is due to the increase in the number and complexity of on-board

systems and weapons. Numerous instruments, switches, buttons, levers and other components are put in an aircraft's cockpit for monitoring their work and the control of the aircraft's engines and weapons. The oversaturation of a modern aircraft's cockpit, with all these components, extremely complicates the pilot's work during flight. In its most stressful phases, he is not able to free his hands from the aircraft and engine joy sticks. Therefore, in past years numerous control units for systems, requiring constant monitoring and pilot intervention, began to be concentrated on these joy sticks.

For example, in the American F-15 fighter there are five buttons and switches on the aircraft's joy stick, and on the throttles there are seven more buttons. During aerial combat, the pilot of this aircraft must conduct up to 20 operations with control elements from the moment of target detection to a missile launch. At the same time, he can not be distracted from tracking the target on the screen of the on-board radar and on the infomation image display on the windshield.

In the journal AVIATION MAGAZINE, it was noted that the operations of the F-15 aircraft's systems places a great burden on the pilot during flight. In order to manage them successfully, constant practice in the use of all on-board systems is necessary, since only steady practice insures the required level of automation of its operations during a reaction to a change in situation.

In studying this, foreign military specialists are working on improving the aircraft's cockpit layout and trying to automate to the maximum their control and also its on-board weapons. In spite of this, the cockpit of a modern fighter remains very much saturated with instruments, buttons, and other control elements for monitoring and control. For example, the cockpit of the F-18 HORNET aircraft is shown in Fig. 1. Its equipment was developed on the basis of experience acquired during the development and operation the the F-15 and also during the conduct of bench trials with pilot participation. It is noted, however, that there are seven buttons on the joy stick and ten on the throttle (several of them dual function). The main improvements are manifested in the installation of multipurpose control and display elements. Due to this, the area of the work panels is reduced by 40 per cent in comparison to the area of similar components on previous-generation aircraft, as for example the A-7 ground-attack aircraft and the F-4 tactical fighter.

The entire cockpit space is divided into three main spheres. In the first, the pilot monitors the operation and status of on-board systems, and in the second and third he analyzes the situation in the horizontal and vertical planes (orientation and monitoring of the course along a moving terrain map, the dead-reckoning of the aircraft's current position, the detection, identification and tracking of air targets, the determination of the degree of threat, and sighting, etc. Three displays on CRTs, controlled by two on-board digital computers are the main imaging units. There are 20 buttons along the perimeter of each display, which, along with the programming complex, occupies more than 10 separate control panels, installed previously on aircraft.

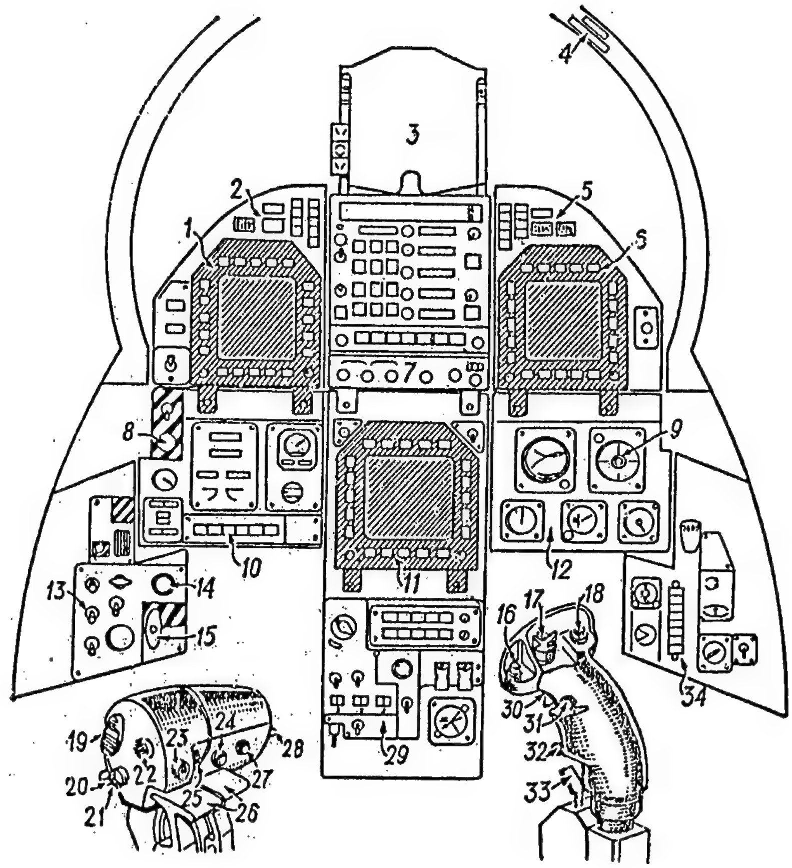



Figure 1. F-18 HORNET Aircraft Cockpit Equipment

1. Status display for the aircraft's systems; 2. and 5. Alarm lights; 3. Display mirror for information depiction on the windshield; 4. Target "lock-on" and open fire (missile launch annunciator; 6. Malfunction display; 7. Control panel for communication, navigation and IFF systems; 8. and 14. Control for payload emergency release; 9. EW equipment display; 10. Monitoring instruments for the control of the engine and fuel system; 11. Navigation display; 12. Reserve (back-up) indicators 13. Control for starting the engine, taxiing lights and automatic breaking/deceleration; 15. Emergency (standard) brake control; 16. Air-to-surface weapon release button; 17. Four-position sensor switches; 18. Pitch and roll trim tabs control; 19. Communications selector switch; 20. Caging and uncaging button; 21. Air brakes control button; 22. Chaff and IR decoy container control button; 23. Target designator control button; 24. ON button for automatic power compensation during the switching of various systems; 25. Control for the radar's elevation angle beam movement; 26. Keys for turning on the afterburner; 27. Button for the target identification system and the control for the forward-looking IR system; 28. On-board signal lights switch; 29. EW equipment control panel; 30. Cannon fire and missile launch release; 31. Three-position selector switch for air-to-air weapons; 32. Nose wheellock; 33. Autopilot disconnect; 34. Control for the release and retraction of the landing gear and for the folding of the consoles and drag hook.

The use of a computer, the program support, the multifunctioning of the processing units and the concentration of control elements on the forward panel give the pilot the capability to attack a target (air or ground), while not diverting [his] attention to the aircraft's cockpit. However, in several crucial phases connected with the creation of high G-loads and with the necessity for the pilot to display a rapid reaction, as the Western press notes, "hands are not enough". Therefore, work is being carried out presently in the United States and other countries--members of NATO, to develop units, allowing an aircraft's on-board systems to be controlled by voice.

One of the systems was tested on the American F-16 fighter, as part of the AFTI program. Each pilot, participating in the experiment, had a cassette with a recording of articulated voice commands peculiar to him. Samples of voice commands were entered into the computer memory. After the pilot supplied the commands, the processor for analyzing the voice compared it with the standard recorded earlier and, in the case of and identity, issued an "order".

The test program began with control checks on a centrifuge, on which the g-load was gradually increased. In the process, it was noted, that the reliability of the system was reduced from 100 per cent in a calm situation to 0 with a G-load of more that 5, when the pilot is generally unable to speak. In intermediate situations, both on the centrifuge and in flight in an F-16, the recognition of a voice, according to the information from the journal FLIGHT occurred successfully in 90 per cent of the cases.

Flight trials of a similar system began almost simultaneously on the French Air force MIRAGE-3P aircraft. Two test pilots completed 40 flights, creating G-loads up to 5 in them at a range of speeds from the minimum to M=1.5. Besides the command mode, crew communication was accomplished with the system also in the form of dialogue. The pilots spoke information about altitude, speed, G-load, course, attack angle, banking, fuel remaining, for which they received an answer by synthesized voice. Later, according to Western specialists' opinion, this may lead to a further reduction in the number of instruments in an aircraft's cockpit. The reliability of the French system was also near 90 per cent.

Similar units are planned to be used primarily in single-seat aircraft during a flight under complex conditions, during the preparation for and carrying out an attack, when the pilot is not able to let go of the joy stick, and conduct a search (target tracking) using an information display on the windshield.

THE REDUCTION IN THE CREW'S EFFICIENCY IN THE MOST COMPLEX PHASES OF FLIGHT. The tension of an aircraft crew (physiological and psycological) increases according to the degree of complexity in the flight conditions. As experience has shown, the most important and saturated phases for a strike aircraft are overcoming PVO and attacking a ground target, and for fighters--the close-in manuevering during aerial combat.

According to NATO military experts' views, the most common method for OVERCOMING AN ENEMY PVO SYSTEM is flight at extremely low altitude with terrain following. American and Israli fighter-bombers showed preference to it

in local wars in Viet Nam and the Middle East. The foreign press reported, that flight at a high speed at low altitudes put a great burden on the pilot. This is explained by the fact that it was necessary for the pilot simultaneously to pilot the aircraft, control its on-board systems, accomplish navigation, conduct a search for the target and to watch for enemy actions.

In studying the character of the European TVD, Western specialists came to the conclusion, that tactical aviation aircraft combat flights will be completed primarily at low altitudes (less than 300 m) at speeds from M=0.5 to 1.2. Currently in the competitive squadrons having JAGUAR, F-111, A-7D, and A-10 aircraft belonging to the air forces of countries--members of the NATO bloc, the "test" altitude, which crews must maintain during flights to the target, is 80 m. Not only are tactical drills worked out at this altitude, but also the skills of the crew members are checked, and their endurance is tested.

After this, as during combat operations in Indo-China, the American air pirates experienced difficulties in carrying out flights at low altitudes, and flight trials to determine several quantitative characteristices were conducted in the U.S. For example, it was established that the maximum length of flight with terrain following by visual control by the pilot at that altitude was approximately 20 minutes. Any longer and his attention was distracted, his reaction dulled, and he had to transfer the aircraft to medium altitude. As a result of the trials conducted in the U.S., the graph (Figure 2) was developed depicting the degree of pilot fatigue depending on flight altitude and speed in a turbulent atmosphere.

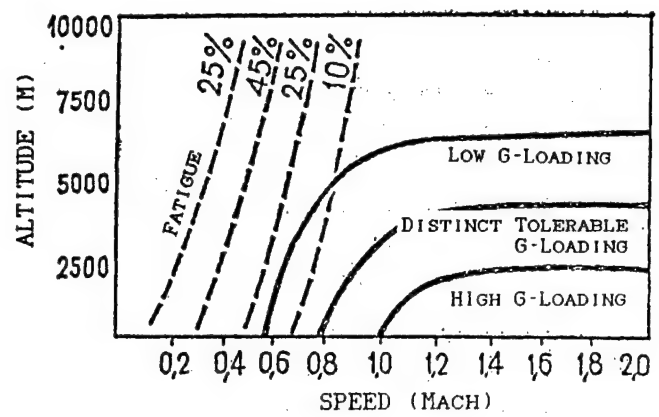



Figure 2. Graph of Pilot Fatigue as a Function of Altitude and Speed in Turbulent Atmosphere

As can be seen from the graph, not only a change in altitude, but flight speed exerts a great influence on the pilot's efficiency. Fatigue sets in rapidly at low speeds (up to M=0.4). Then one sees the range of speeds (M=0.5 to 0.6), during a flight at which fatigue is minimal, and then the physical g-loads are increased again, and are carried over at supersonic speeds. Therefore, a low altitude "supersonic surge" while overcoming PVO was precluded from the tactics of F-111A fighter-bombers. A deep raid with terrain following was completed only at near sonic speed, although the equipment was

designed for high G-loads. The aircraft's capabilities, thus, came into contradiction with the pilot's capabilities.

However, flights at low and extremely low altitudes were continued in local wars and during combat training in the air forces of the U.S. and its NATO allies. As a result, the specific weight of accidents and catastrophies due to pilot error significantly increased. In particular, as the foreign press reported, from 1962 to 1976 (third generation combat jet aircraft entered service in the air forces of NATO countries by the end of this time), 47.2 per cent of the total number of flight accidents were due to pilot error. Of these, almost one fourth of them (more than 11 per cent) occurred by an aircraft colliding with the ground on parts of the flight route with terrain following. It is characteristic that in 1962-1969, this figure was equal to 11 per cent, but in 1970-1976, it had increased to 11.4 per cent, so that a trend in the reduction of accidents for this reason was not observed. Western specialists note, that, in spite of the improvement in navigation and flight equipment and the automation of flight control systems, man did not err less. Having received relief in one sphere of his activities during combat flight, he became more burdened in others. Therefore, the total remained as before and the ground surface presents no less of a danger to the pilot than the firing of PVO systems which he tries to avoid by descending to extremely low altitudes.

In the target area an aircraft usually gained altitude, but the situation became more complicated and the pilot's tension increased. It was necessary to be spread in three directions: to accomplish the search for the target, to overcome the target's PVO, and to form a maneuver for attacking it. As a result, the number of flight accidents in this phase of combat flight was even higher than during flight along the flight route at low altitudes. In particular, in 1962-1969, they reached 14 per cent, and, in 1970-1976--12.3 per cent of all accidents were caused by pilot error. Western specialists explain the hardly noticeable trend toward a reduction in this case by the automation of search and attack processes.

As to the latter, then, work in the mentioned direction is continuing. For example, according to foreign press reports, the first stage of trials of the F-15B demonstration aircraft concluded in the U.S. with a combined flight control and on-board weapons fire control system.

The system regulated the deflection of the aircraft's control surfaces depending upon the selected firing modes. For example, during an attack on a ground target, orientation of the fuselage was changed slightly in the horizontal and vertical planes without a change in the speed vector. This provided the pilot with the capability to approach the target along a curvilinear path with a G-load of 2, simultaneoulsy maintaining the cannon in the direction toward the target. The calculated maneuver was combined with sighting and attention was concentrated on the main element-- the attack. The pilot carried out the search for the target with the help of the ATLIS-2 electro-optical system, which was mated with equipment for processing information on the target and fire control.

According to foreign specialists' opinion, the sighting precision with the PHANTOM-2 aircraft, widely used by American aggressors in Indo-china and by Israeli extremists in the Near East, essentially depended on the target detection range and the magnitude of the turn angle to the target during the overlay of the sighting mark. At detection ranges of more than 3-4 km, the turn had practically no effect on precision tracking, but at 1.5 km and less, flight errors partly led to a break-off of the attack. The input of the display mode with continuously computed bomb drop points provided the aircrafts' crews satisfactory operating conditions due to the reduction in the duration of target tracking time.

As the results of the flight trials showed, with such a sighting method, the pilot is able to pursue and attack a mobile ground target, carrying out flight on a parallel course or located above it, maneuvering in a any plane, and in limited space. In this case it was necessary for him to deviate from the old method of directing fire by the application of the speed vector to the target. The approach to the target and the antiaircraft fire avoidance maneuver are merged into one process. Besides, the capabilities to evade antiaircraft fire, the total time of loitering over the target is one-half to one-third the time that of an aircraft not equipped with such a system (in air force competitive subunits in NATO countries, aircraft located more than 30 seconds in the air defense zone are considered "shot down"), and except for the constant (straight line) portions of flight, aiming antiaircraft fire at an aircraft is significantly more difficult from the ground.

A fighter pilot experiences the greatest tension during close-in aerial combat. The physical consequences of the development of G-loads during energetic maneuvering are added to the psychological factors. Carrying out a maneuver with the greatest angular velocity of a set turn (at M=0.8) leads to the creation of G-loads equal to 4-5. During short after-burner turns, often used in combat, they reach 8-9, the linit of man's physical capabilities.

The sphere of average values of speeds and G-loads, derived more than ten years ago by foreign specialists as a result of the study of aerial combat experience and the modelling of various phases of flight while conducting them, specifically, in the pursuit (approach) phases, maneuvering in combat and the break out from it are shown in Fig. 3. In addition, the limit is shown on the graph, beyond which precise firing is impossible since all "reserves" of rotary movement in the flight mode, which lie beyond this limit are already used up, and the pilot can not successfully force the aircraft to fly faster along the curve, in order to insure aiming.

Thus, "human" and "equipment" factors have their "limits", which impede the employment of weapons in close-in aerial combat.

In order to provide for more reliable destruction of the aerial enemy, research is being conducted abroad on the use of a "two dimensional" method of turning the aircraft toward the target without pilot participation, that is, by using automated aircraft and weapons control systems.

For example, in the United States, for the AFTI program, an automated attack system, which combines sensor information and equipment for tracking a

maneuvering target with displays and control systems, was installed on the experimental F-16 (in the western press it often is designated the AFTI/F-16). The information unit includes a helmet-mounted target designation system, an information display image on the windshield, the APG-66 radar and a forward-looking IR system.

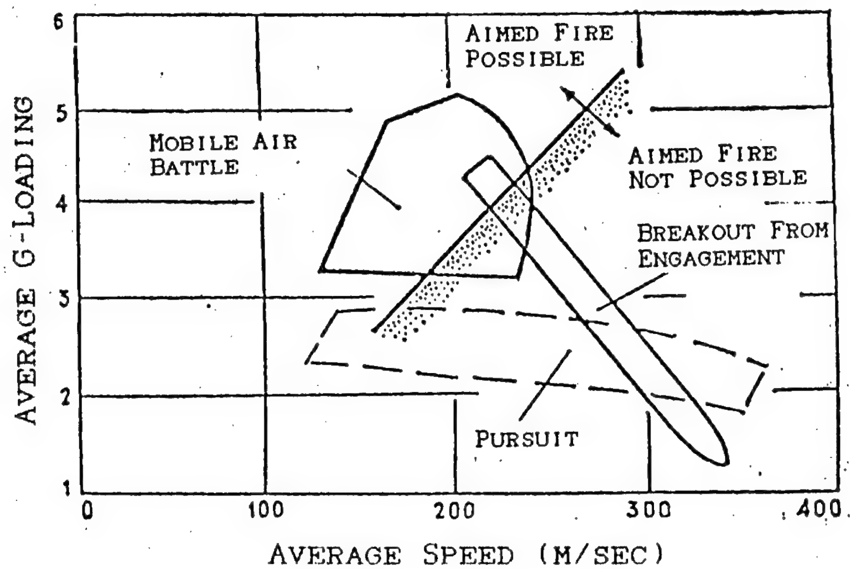



Figure 3. Spheres of Average Values for Speed and G-Loads in Various Flight Phases While Conducting a Close-in Air Battle.

The helmet-mounted target designation system establishes a line of sight along the direction of the pilot's gaze. The object of the latter is to combine (by the aircraft's maneuver) miniature cross hairs, located in a transparent panel in front of his eyes, with the target. There is a light on the end of each cross hair filament, showing the turn direction. As soon as the line of sight is superimposed on the target, all four lights burn, and the radar "locks-on" the target and begins to track it automatically. The pilot monitors the situation on the image information display on the windshield (his field of view is 15x20 degrees), where the supportive information about the aircraft (altitude, speed, course, closing speed, G-load) and also on the weapons readiness is depicted. The target designation error, that is the difference between the direction to the target and the aiming lines of the on-board weapons, is transmitted to the on-board computer. The latter causes the aircraft's control surfaces to move very rapidly, carrying-out a spatial maneuver, which compensates for these errors.

The AFTI/F-16 aircraft has supplementary controls, which support flight modes with six degrees of freedom. Because of this, the aircraft can carry out so-called non-standard maneuvers in aerial combat--a change in the attack angle, "flat turns" in azimuth, and plane-parallel offset. All this allows the pilot to hold the target in the crosshair continually or to bring the sight line to

the necessary lead angle. Non-standard maneuvers with a change in the spatial position of the aircraft's fuselage economize time for sighting and firing. However, as the Western press notes, they are difficult for the pilot. Therefore, in order to cancel the lateral G-loads, unacceptable to man, Western specialists are busy searching for the most favorable position for him in the cockpit. Specifically, special pads for securing the pilot's shoulders are being used on the AFTI/F-16 aircraft, which will eliminate the lateral displacement of his body and fix the head position for the convenience of reading-out information and sighting. However, according to statements of American specialists, during sharp flat turns the pilot is disengaged for a short period of time from actively monitoring the situation.

Work to develop and test automated flight control and weapon systems on aircraft, equipped with supplementary control surfaces, is being conducted also in the FRG and several other countries. Foreign military specialists note that such systems free the pilot from carrying-out precise gun laying and aiming operations, and insure non-standard maneuvers when attacking a target, but they do not reduce the G-loads being experienced, and these sharply diminish his reaction and negatively influence his thinking.

THE INCREASE IN THE FLOW OF INFORMATION SUBJECTED TO PROCESSING (ANALYSIS). In looking at this question, the journal AVIATION MAGAZINE wrote: "Until now, the control of an aircraft did not require the constant correlation of information from various sensors, and the information from a control and navigation system was processed sufficiently by the pilot himself. Currently such an operating pattern is unacceptable because of the sharp increase in the volume of received heterogeneous information. For improving the pilot's interaction with the aircraft, through a simultaneous decrease the work load, it is necessary to arrange and generalize the information flow and improve the way it is presented."

It is noted in the Western press, that the requirments for information characteristics continually increase because of the complexity of the control systems. The distortion of information on the situation and the location of enemy targets is inadmissible since the plan established according to them will be incorrect, and the employment of weapons ineffective.

The pilot of a modern aircraft constantly takes in and processes a stream of "instrument" notification and command information during a combat flight. Besides this, he responds to warning and notification signals received by radio. Circumstances often demands a rapid, simultaneous and correct response to several types of received information. Foreign military specialists claim, that a pilot's eyesight and hearing are already overloaded by the sensations of various light and sound signals. Therefore, measures are being employed currently to relieve him. Work is being carried out in two primary directions: the replacement of man by devices which independently respond to received information, and the regulation (the organization) of information and the imparting of it with better use of visual aids and memory devices.

Regarding the second direction, the foreign press noted that analogous principles of representing information were used in the first electronic displays, and its memory was provided by screen persistence. The television-

type displays which had been applied after that were more reliable, and digital memory units increased the display's resolution capacity, and the pleochromatic representation of current information allowed the list of operations (activities) received for execution to be increased. The most important area for using electron-beam tubes (CRTs) is connected with the representation of sighting and flight information, and also with situation displays in the verticle and horizontal planes. The organization of the system to represent information on the windshield with the on-board radar allowed the target identification process and its attack to be combined. Specifically, after the detection of the target, its artificial mark is depicted on the system's display and the pilot no longer tracks using the radar image. Navigation and sighting information are produced simultaneously on the display, which significantly simplifies the spatial orientation and observation of the situation.

However, in spite of all that is mentioned above, as the experience of the operation of existing combined foreign systems showed, their effectivenss depends more than ever on the pilot's skills. He carries out a dialogue with the computer on the basis of information produced on the screen by pressing buttons on the periphery of the display depending upon the phase and flight mode and also on the situation which had developed. According to foreign specialists' opinion, for the acquisition of the necessary skills for such "conversation," lengthy pilot training on special trainers is required. Therefore, a preliminary program of standard operations is entered into modern control systems, and three-pointer displays (for example, the altimeter) are being replaced by digital ones, and multipurpose screens are being developed, etc. Concerning this question, the English journal FLIGHT noted, that traditional instruments will be used soon only as back-ups, and by the 1990s, they will be completely replaced by multipurpose electronic displays with a high degree of reliability and a large volume of concentrated information will replace them, using colored CRTs. There is not yet a single view on the form of information representation among Western experts. For example, for the representation of the flight mode, pilots prefer circular scales as one such system being tried and others--vertical figures, etc.

A REDUCTION IN DECISION-MAKING TIME is called for by the increase in the flight speed, the operational range of aviation weapons, and by the rapid change in the situation. For example, the most important phases of aerial combat--the approach and the attack are becoming shorter. The same number of operations being carried out by the pilot to conduct them steadily increases because of the high complexity of the aircraft's systems and its armament. In conducting combat, the pilot must make decisions successively while conforming to the situation. According to foreign press reports, the experience of aerial combat with supersonic fighters showed that the situation changed more sharply and in unexpected directions. The air enemy appears unexpectedly and rapidly employs weapons. Specifically, the English journal FLIGHT noted that aerial combat, the conduct of which is always marked by special difficulty, was still more complex; the missile launch has to be carried out from greater distances and under all aspects; the loss of the aerial enemy from the field of view at distances of 11-13 km, under contemporary conditions, can be considered the forerunner of destruction, and at the same time several years ago, this event still did not have much serious significance. In spite of the

fact that many means of target search, warning and protection, increasing the survivability of fighters, has been sufficiently developed, the outcome of battle depends primarily upon the pilot.

Western specialists emphasize the following points on the theory of combat: "in order to achieve success in an aerial fight, it is necessary to get ahead of the enemy in thoughts and actions". This means that one must more rapidly analyze the situation which has developed and make a decision instantly, in response to its development. With regard to the increasing requirements, in the pilot aerial combat training programs of the air forces in countries--participants of the aggressive NATO bloc, currently the development is envisioned of types of defensive methods ("the brake", the "hard turn", "high-G roll" and others), which can be carried out automatically in response to the enemy unexpectedly appearing in a threatening position. The main position is allocated to the reflex, that is, the motor processes must lead mental ones, or be connected with them in time.

However foreign specialists understand that to draw up the combat plan correctly and to implement it, relying only on reflexes, is impossible. They consider that in connection with the complexity of equipment, weapons, and subsequently the conduct of aerial combat, the pilot (especially of single-seat aircraft) must not only increase the level of tactical thinking, but think rapidly. But to do this is not simple, since man's motor and thought reactions, even of the best trained men, have their limits. The following was written in one of the foreign journals concerning this cause: "Just recently a pilot accomplished the interaction with one of the aircraft's functional control systems. In so doing, a great deal of time was spent on piloting and less on decision-making, that is, the pilot completed the "duty" of a central processor and communications unit between functional subsystems. Such an organization is useless under present day conditions for aircraft with complex airmament and equipment. The necessity to "enlist" on-board computers for reducing the realm of missions, solved by the pilot cannot be put off.

According to foreign specialists' opinion, only artificial intelligence systems, which are able to cope with the assessment of a large number of complicated situations in a combat environment, can be of help to a pilot. In comparison to computers, they must be more flexible and be able to solve tasks having elements of uncertainty, ambiguity and inaccuracy. In additon, they must possess the capabilty to determine, from the beginning, the most important aspects of the mission, and then enlist computer resources for their solution. One of the main features of artificial intelligence is its "searching character" by which all possible solution variants are considered. In this case, the computation does not occur, but the selection of an optimum solution is on the basis on the employment of heuristec methods (empirical methods for approximated calculations).

Currently the military leadership of the U.S. and their NATO bloc allies are showing significant interest in the practical employment and programming support of systems with elements of artificial intelligence. Artificial intelligence technology is considered by them to be one of the main spheres of military technology. It is intended to develop and use it for the solution of such tasks as the vectoring to the target, conducting communications using

natural language, the analysis of images (reconnaissance information). In considering this technology as an important direction in the development of aviation and other weapon systems, the Nato countries, and primarily the U.S., are spending millions of dollars on it.



9355
CSO: 1801/129

THE USE OF FIBER-OPTIC EQUIPMENT IN THE U.S. AIR FORCE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 53-55

[Article by Lt Col V. Maslov; "The Use of Fiber-Optic Equipment in the U.S. Air Force," passages rendered in all capital letters printed in boldface in source]

[Text] American right-wing circles widely employ new achievements in science and technology in their militaristic preparations. Specifically, in the U.S. fiber-optic equipment and especially fiber-optic cables are being developed and introduced into various military systems. These cables are significantly superior to standard coaxial cables in their capabilities. For example, the AN/GAC-1 fiber-optic cable, allowing communications to occur over distances from 6-64 km, is being developed as a replacement for the CX-11230 two-core metal coaxial cable, used in communication centers and in interobject cable communication lines. The 6-channel AN/FAC-1 cable was developed as a replacement for the CX-4566 26-channel metal cable. It is reported in the foreign press that a fiber-optic cable already exists which can be layed along the ground's surface from a helicopter flying at a speed of 50 m per second. Its diameter is 2.54 mm and its weight 5.64 kg per km. It has a breaking strengh of 68 kg, and a signal attenuation of 5 dB/km, and is manufactured in 2-km length packages. The use of this cable provides the capability to organize communication at a distance up to 8 km at a rate up to 20 Mbits per second in the frequency range from 0.8 to 1.3 mkm.

The great deal of interest being paid to fiber-optic communication lines is due to a number of their important advantages over traditional coaxial and multicore cable lines. Foreign specialists consider these important properties to be their small size and weight, the immunity to radio interference, the absence of electromagnetic radiation, the low signal attenuation, high mechanical strength, resistance to fire, resistance to corrosion, heating and chemically active substances, and a relatively small cost.

Fiber-optic cables are significantly lighter than copper ones. For example, the linear weight of a conventional copper cable having a diameter of 75 mm is 4 kg/m, but a fiber-optic cable with the same carrying capability is approximately 50 g/m with a diameter of 6mm. This advantage is considered

especially important for on-board aviation equipment. It is reported , that the cable connections for the weapons control and navigation system on the A-7D CORSAIR-2 has around 300 metal lines with a total length greater than 570 m and a weight up to 15 kg. These can be succesfully replaced by 13 fiber-optic cables with a total length of 70 m and weight of 1.2 kg.

Fiber-optic cables' high carrying capacity is due to the wide bandwidth which, depending upon the type of cable, for the wave length 1.3 mkm extends from 3-5 GHZ to 100 GHz. On account of this, the information capacity of fiber-optic communication lines is almost 10,000 times higher than coaxial ones.

An important property of fiber-optic cables, in contrast to copper ones, in which a rapid increase in signal attenuation occurs with an increase in the modulation frequency, is the low attenuation. For example, if the attenuation for a copper coaxial cable is from 20 dB/km (with a frequency of 60 MHz) to 140 dB/km (900 MHz), for a fiber-optic cable the attenuation in this frequency range is constant and does not exceed 10 dB/km. Presently, judging by reports of the foreign press, fiber-optic cables are already being developed with an attenuation as low as 0.2 dB/km, the use of which allows the ground components of various systems to disperse. The property of low attenuation in fiber-optic cables provides the capability to increase the operational range of middle and long-range communication and data transmission lines.

In spite of the adoption of special mesures for shielding power cables and sources of radiation, a high level of elecromagnetic interference usually is present in an aircraft, which does not allow the error rate in the transmission of information between an on-board system to be increased less than 10-6. It is considered, that due to the use of fiber-optic cables, the necessity for special shielding falls off and the error level is reduced to as low as 10-10. Besides this, in view of the complete internal reflection in a fiber-optic cable, the errors in the transmission of information are precluded due to the absence of crossover interference. This same stability precludes electromagnetic radiation and provides security and the impossiblity to intercept information being transmitted.

The good dielectric property of an optical fiber provides complete electronic isolation between emission sources and receivers, and due to this general grounding is not required. The absence of sparking and other heat-producing processes caused by short-circuits, unloaded and damaged lines in other systems is due to the complete fire resistance of fiber-optic cables. It is possible to lay them through explosive and fire-hazardous space.

The tempurature stability of fiber-optic cables reaches as high as 10000 (for coaxial cables --up to 3000). Due to the use in them of shells of sheathed (armored) elements made from kevlar, the mechanical strength of such cables is increased and is not inferior to the strength of metal ones. This allows them to be pulled through partially-filled cables lines, to be layed directly on the ground, and to be used in sections with a length of more than 3 km.

One of the important properties of fiber-optic cables is considered to be, that they can be manufactured from materials, practically insensitive to radiation emmissions from nuclear explosions. It was reported specifically,

that such cables received damage during trials from gamma-radiation with a radiation level only 1 million rads per hour.

Due to the above-enumerated advantages, fiber-optic cables are receiving wider use in the US armed forces, where many programs are being carried out, which are designed to develop and introduce fiber-optic equipment into on-board aviation and shipborne devices, communication and information transmission lines over various distances, including the internal communication lines of military bases and command posts, in satellite communications, remote control and other systems. Judging by foreign press reports, the following programs for the use of fiber-optic equipment are being implemented in the U.S. Air Force: in aircraft on-board devices; in launch and control systems for the MX intercontinental missiles, and air- and ground-launched cruise missiles; at command posts and control centers of independent commands; in tactical communication, protection and light signalling systems; in nuclear weapon test systems and missile firing ranges. In aircraft, fiber-optic cables are being introduced in the entire installations, complexes and subsystems of on-board flight devices, depending on their function.

It was reported on the use of similar cables in the transmission lines of the AN/GYQ-21 computer units, which are used at various levels of many control, reconnaisance and communications systems, including in the headquarters of the US Air Force's Strategic Air Command. The replacement of metal cables, permitting a maximum equipment distance up to 15 meters and a digital data transmission speed of 50 kilobits per second, with fiber-optic ones allows this distance to be increased to 2 km and the transmission speed as high as 60 megabits per second.

Fiber-optic cables are used in the 485L tactical aviation control system's ground communication lines. This highly-mobile system includes a number of centers, the most important of which are air support control centers (TsUAP) and control and warning centers (TsUO). The program for the introduction of fiber-optic equipment intends to use them in the internal communication elements of these centers, which, according to American specialists' opinion, will shorten the deployment time for the system and increase its survivability. A TsUAP usually consists of an AN/TSQ-93 operational center and three communication centers (AN/TRC-97A tropospheric [scatter], the AN/TSC-60 short wave [HF] and the AN/MRC-107/108 radio relay) connected to it by the CX-4566 26-channel coaxial cable, which supports the communication of the TsUAP with aircraft in the air and other elements of the 485L sytem. According to U.S. military experts' estimates, the replacement of CX-4566 cables in cable lines having a length approximately 460 m between an operational center and the communication centers, with fiber-optic ones reduces, by a factor of 10 the total weight of the connector cables, will support the dispersal of communication centers from the operations center up to 3 km. In addition, the planned replacement of a coaxial cable between the AN/TRC-97A troposcatter communication station and its antenna will provide the capability to to disperse them at a distance up to 1 km, which will prevent the enemy from damaging the station itself by launching a antiradiation missile against its emmissions.

The TsUO includes the following centers: the AN/TSQ-91 operations center, the AN/TGC-28 telegraph communication, the AN/TSC-62 technical control, the AN/TTC-30 switchboard, and also the AN/TPS-43E three-dimensional radar. The operations center is connected with the radar by a tri-axial cable, which allows it to be dispersed all told, by merely 122 meters from the operations center's compartment. It is considered, that the replacement of this cable with a fiber-optic one will support the removal of the radar to a distance of 5.4 km with an overall reduction by half in the cable's weight.

Presently, as evidenced in the foreign press, more than 150 km of fiber-optic cables are used as the main communication lines in control, monitoring and information display system for the MX ICBM trials at the flight test center at Vandenberg Air Base, (California). The launch installations and test beds are joined by these cables to the missiles and the remote control center.

Fiber-optic equipment is being used also in engine monitoring systems and aircraft structural components, and in image transmission lines from difficult to reach and remote positions. For example, a fiber-optic borescope was developed, which has a flexible cable with a diameter around 8 mm, that provides 2400 scanning, and has a newly developed source of illumination, which allows taking high-quality photography of the surfaces being surveyed. Also being discussed is the question regarding the use of fiber-optic equipment in a control system for aircraft subassembly construction, based on the introduction of extrordinarily thin glass-fibers into individual aircraft structural subassemblies to detect cracks and other defects by the discontinuity or changes in the passing of light in these fibers.

The foreign press notes the fact that fiber-optic equipment is used in television systems at Edwards Air Base (California), where a day landing surface for the SHUTTLE spacecraft is located on the Great Salt Lake. In a mobile closed-circuit television system, remotely controlled television positions were dispersed along the runway, and the remote observation posts of each television position, contained in vans, were located 100 m from the runway. The observation posts were connected to the television posts by an 8-channel fiber-optic cable, with 7 channels serving the transmission of images and sound, and the 8th for command-and-control.

Fiber-optic cables are used in target protection systems, as extended sensors for a signalling system against the intrusion into the protected zone. It is believed that it is possible to use them as simple-access communication lines--a piezodielectric sensor for modulating the flash signalling in the fiber are fastened to the cable at any point. The use of fiber-optic equipment in closed-circuit television systems for the protection of airbases allows separate areas, platforms and corridors to be kept under constant visual observation, and with this, the cameras can be positioned at a distance of approximately 1 km from the monitors, and with the presence of amplifiers, more that 9 km.

Presently a planar fiber-optic television screen is being developed, which creates a high-contrast image even in good indoor illumination and provides a significant increase in the dimensions of the original image, and allows television screens of large dimensions to be developed. Such screens are

intended to be used as various plotting boards in command posts and control posts, especially in the highest command units.

The rapid tempos for perfecting the technology of manufacturing fiber-optic devices, the increase in their technical characteristics and capabilities, their sharp reduction in cost, and also the presence of other important advantages predetermined their wide adoption in various military systems, especially in aviation equipment.



9355
CSO: 1801/129

## AIR FORCE RUNWAY REPAIR SUBUNITS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) p 56

[Article by Lt Col S. Vasilyev; "Air Force Runway Repair Subunits"]

[Text] The Bundeswehr command considers one of the most important missions to be maintaining the Air Force's formations and units at a high combat readiness during combat operations, especially the flight formations and units. According to West German military experts' opinion, for its successful solution it is important to maintain the conditions which support the employment of aircraft--the Air Forces's main strike resources. In studying the probability of enemy mass strikes from the air on the main air bases and reserve airports, the consequence of which could put the runways out of commission, thereby limiting the operations of aircraft, the FRG Air Force command attaches special importance to the organization and conduct of rapid runway repair work.

Stemming from this, it included special regular subunits in the make up of combat aviation squadrons--rapid runway repair companies (one per squadron), to whom the mission is entrusted to restore runways during combat operations in a short period of time. According to the approved organizational structure, a company consists of three platoons of 50 men (in peace time they are staffed with less than half, but in case an emergency situation arises and mobilization is announced, they are brought up to wartime strength by the call-up of reserves).

The training of the personnel for these companies is accomplished ahead of time: for the zone of responsibility belonging to the MTO group "North"--it is in the Air Force's 2nd Combat Engineer Training Company at Diepholz, and for the MTO group "South"--it is in the Air Force's 1st Combat Engineer Training Company at Fuerstenfeldbrueck. In the first stage of training (lasting seven weeks), they study the materiel and instruction in the servicing and operation of vehicles and engineering equipment, assigned to the rapid runway repair companies (such as excavators, loaders, bulldozers, scrapers, graders, various types of cargo vehicles, road rollers, compressors, jack hammers, specialized machines for cutting concrete surfaces and other equipment). Then, for three weeks, the personnel are trained in the comprehensive use of the equipment.

After the completion of training, a final exercise lasting 2-3 days is conducted.

Based on information from the foreign press, the exercise is conducted according to the following scenario. A main basing airfield for a Bundeswehr Air Force's air squadron is subjected to an enemy air strike using 500-kg concrete-cratering bombs. As a result, several hit the airfield's runway, forming craters with a diameter of 20 meters and a depth of 3-4 meters (all these figures were taken from a NATO Allied Air Forces staff estimate for the beginning of combat operations under modern conditions). Rapidly upon the conclusion of the raid, the airbase's ground defense command post begins to determine the scope of runway damage and to equip a temporary runway having dimensions of 15x1500 meters (by using undamaged portions and the filling of parts of the craters) in a short period of time.

The location of existing taxi-ways and aircraft shelters is considered when selecting a place for a temporary runway. A topographic section marks its center line using surveying stakes. A section of the ground and fragments of the concrete surface, blown out by the explosions, etc. are cleared. After this, the detachment begins to work, equipped with special machines for cutting concrete surfaces (circular saws, the teeth of which are strengthened with diamond heads, capable of cutting reinforced concrete up to 12 cm thick). Using these, the damaged parts of the concrete surface along the edges of the crater and its parts cracked-up from the explosion are removed (filled up). Then these pieces are broken up by jack hammers, hauled by excavators to dump trucks and taken to a dumping place, after which the craters are filled in by gravel or crushed rock.

The filled-in portions are compacted thoroughly using rollers to keep the ground from subsiding (this work is completed by a road-construction equipment detachment). A special decking, assembled from 140 separate aluminum plates, measuring 23x16 meters and weighing 13 t, is layed over the filled-in crater (craters). It is erected by a detachemnt of 20 men, dragged to the crater's position by towing vehicles or tractors, and is secured by metal pins. In the interests of speeding up this work, reserves of the materials and equipment for the details mentioned above are created in peace time in the immediate vicinity of each Air Force's permanent basing airfield.

After clearing away the fragments of concrete covering and the remains of construction materials from the ground, the temporary runway is considered suitable for the take-off and landing of aircraft, and an aviation unit which is based at the given airfield can resume flights. Further complete restoration of the runway is accomplished in intervals between flights, and sometimes during them, if sufficient safety for the flight of aircraft, and also the repair unit's personnel is insured.



9355
CSO: 1801/129

## CURRENT, FUTURE DEVELOPMENTS IN NATO NAVIES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 57-64

[Article by Capt 1st Rank V. Afanasev; "Current and Future Developments in NATO Navies"]

[Text] The imperialistic circles of the U.S. and its North Atlantic Bloc allies, while conducting their adventurist global policy directed at achieving military superiority and global hegemony over the Soviet Union and its socialist comrades, continue their unceasing arms race and intensive preparations for a new war. Covering this with deceitful demagogic pronouncements about "the soviet threat," U.S. military preparations emphasize strengthening its naval forces, which for some time have been used as a weapon to subjugate and enslave nations and people, and as a means of exacerbating the international situation and causing wars and armed conflict. Considering the substantial investment made in the Navy during the course of and following the last wars, Western military specialists stress that the fleets will play a leading role in achieving the long established goals of the NATO leadership well into the future.

As can be read in the foreign press, NATO naval forces are called on to execute the following missions: conduct nuclear missile strikes against targets on the enemy's territory; guarantee maritime movement of troops, arms and items of military technical resupply; furnish support to land forces operating in littoral regions; achieve and maintain control in separate regions of the oceanic theaters; conduct blockades; carry out amphibious assault operations; conduct reconnaissance; and exert military-political pressure on independent governments who do not agree with Washington or its NATO allies, by means of show of force.

It is noted in the foreign press that the problems of the navy, their role in armed conflict and their condition and perspectives for the future flow from official NATO and USA wartime strategies: the American "direct confrontation" and NATO's "flexible response." In view of this, the leading NATO members, headed by the U.S., are pressing to create balanced navies in which there will be, in equal measure, strategic forces, designated for general nuclear war, and general purpose forces, designed for local wars. In NATO leadership's opinion, modern fleets must be able to perform a wide range of military and

politico-military tasks, to operate with mobility and flexibility in any circumstances anywhere in the world and to apply a variety of means of destruction quickly, including strategic weapons. NATO naval force structure derives from these above mentioned premises. Special emphasis is placed on commissioning new ships, modernizing and reequipping those now in service as well as decommissioning obselete units. Throughout this process, a certain decrease in the number of ships in the fleets of different NATO countries in no way diminishes naval strength of these countries as a whole, since older, retired ships are, as a rule, of lesser displacement and the newest transfers to the fleet are capable of a broad range of missions.

The UNITED STATES deploys the most modern and most powerful navy in the capitalist world, and is assigned the key role in realizing the ruling government circles' hegemonistic, global intentions. At the beginning of 1986, it numbered about 460 combatants (including 33 in the reserves); as well as about 110 auxiliaries and roughly 100 vessels of the Military Sealift Command; and more than 1,000 floating yard craft. In addition, the fleet grows in time of war through acquisition of over 240 Coast Guard coastal patrol ships, cutters and support ships. Naval and Marine aviation includes about 2,850 helicopters and aircraft. Navy strength stands at 783,300 personnel, of which 201,300 are Marines.

American fleet construction is proceeding in accordance with a longterm program of naval force development, leading to a total of about 600 warships.

In the structure of the U.S. Navy, a special place is given to the SSBN, which is one of the main components of the nation's strategic strike forces, and with whose help Washington is intent on carrying out its aggressive concepts. The U.S. Navy has 37 SSBNs (6 OHIO-Class and 31 LAFAYETTE-Class), in whose hulls, as reported by the digest of naval affairs, JANES, are more than 5,000 nuclear warheads, i.e., approximately 55 per cent of the country's strategic arsenal.

In 1985, further expansion of the TRIDENT nuclear missile system was continued. USS ALABAMA (SSBN 731), the sixth OHIO-Class ship, was commissioned. In addition, there are six other submarines in various stages of construction. OHIO-Class SSBNs, as the foreign press notes, are the most powerful underseas ships ever built in the United States. Their principal characteristics are: surface displacement 16,600 t; submerged 18,700 t; length 170.7 m; beam 12.8 m; draft 10.8 m. The power plant produces 60,000 hp enabling a submerged speed of up to 25 kts. Operating depth is 300 m and it is armed with 24 TRIDENT-1 (TRIDENT-2 in later models) ballistic missiles and four 533-mm torpedo tubes. It has a crew of 133, including 16 officers.

OHIO-Class submarines which are currently in the fleet order of battle as well as 12 of the LAFAYETTE-Class which underwent conversion between 1978-82 are armed with the TRIDENT-1 ballistic missile. This missile has a multi-charge, MIRV-Type warhead (eight individually targettable 100 kt warheads); a range of 7,400 km; accuracy (circular error probable, CEP) about 450 m. According to the foreign press, the Pentagon is pressing for a new, more powerful TRIDENT-2 ballistic missile (up to 14 individually targettable 150 kt warheads; a range of 11,000 km; and a CEP of about 100 m). This missile should enter service

towards the end of the 1980s, or the beginning of the 1990s. It is programmed for installation on OHIO-Class SSBNs starting with SSBN 734. Pursuant to the naval development program, it is planned to build no fewer than 20 OHIO-Class units by the year 2000.

General purpose naval forces are also receiving a good deal of attention by the U.S. politico-military leadership. These forces include nuclear (non-SSBN) and diesel-powered submarines; surface ships of all classes and support ships.

A special place in the plans for conducting combat operations is envisioned for submarines. According to JANES, at the beginning of this year the U.S. Navy included 97 nuclear submarines: 33 LOS ANGELES-Class; 37 STURGEON-Class; 13 PERMIT; 5 SKIPJACK; 3 SKATE; and 2 ETHAN ALLEN1; as well as GLENARD P. LIPSCOMB, NARWHAL, TULLIBEE and SEA WOLF and 4 diesel boats (3 BARBEL-Class and 1 DARTER). Five SSNs are in the reserve submarine fleet.

Foreign press specialists emphasize that the modern SSNs area multipurpose ships; their weaponry (mines, torpedoes, ASW, cruise missiles, and antiship missiles) enable them to fight both surface and subsurface enemies and conduct land attack operations.

In the comments of the foreign press, the LOS ANGELES-Class submarine is the most combat effective warfighting submarine in the U.S. Navy. Its tactical characteristics are: submerged displacement 6,900 t; a nuclear power plant (as seen in the American press data) which can produce 35,000 hp, giving it a submerged speed of over 30 kts; operating depth up to 450 m; armament includes four 533-mm torpedo tubes for the MK-48 torpedo, the SUBROC ASW rocket, the HARPOON antiship missile and the TOMAHAWK cruise missile. Its crew numbers 127, including 12 officers. It is reported that, commencing with CHICAGO (SSN 721), all submarines will be equipped with vertical launch systems (12 missiles).

According to force development plans, the navy intends to construct 65 LOS ANGELES-Class SSNs (33 are already in the fleet, 11 are on the ways or undergoing sea trials, and orders have been placed for another eight). The navy is also pursuing development and construction in the 1990s of a new generation submarine.

The aircraft carrier (CV) remains the most important element in the U.S. Navy's general purpose forces, which is the strike arm of the fleet in both general nuclear and limited wars with or without employing nuclear weapons. Judging from material in JANES, there were 14 CVs in the active fleet at the beginning of this year (four nuclear powered--ENTERPRISE and three NIMITZ-Class; and ten conventionally powered ships; i.e., four KITTY HAWK-Class, four FORRESTAL-Class2 and two MIDWAY-Class). ORISKANY, BONHOMME RICHARD, BENNINGTON and HORNET are in the reserve fleet. LEXINGTON (built during WW II) is used as a training ship for carrier pilot qualification (she will be replaced by CORAL SEA in 1992).

Carrier based aviation, as noted in the Western press, numbers more than 1,300 combat aircraft and helicopters, is organized into 13 air wings. Included in

a wing composition are A-6E INTRUDER and A-7E CORSAIR-2 light and medium strike aircraft, F/A-18 HORNET fighter-bombers, F-14A TOMCAT and F-4J/S PHANTOM-2 fighters, RF-14A TOMCAT reconnaissance aircraft, E-2C HAWKEYE early warning and control aircraft, EA-6B PROWLER and EA-3B SKY WARRIER electronic warfare aircraft, S-3A VIKING ASW aircraft, SH-3D/H SEA KING ASW helicopters, LAMPS multipurpose helo system, and RH-53D minesweeper-helos. The A-6E INTRUDER, A-7E CORSAIR-2, and the F/A-18 HORNET (more than 550 aircraft) carry nuclear weapons.

The U.S. Navy command pays particular attention to development of sea-based air. It takes very active, practical measures to equip carrier aviation units and subunits with new, modern combat aircraft, weapons and equipment and to modernize specific types of aircraft and helicopters. In particular, the A-7E Corsair-2 and the F-4 PHANTOM are being replaced by the F/A 18 HORNET. As far as numbers of airwings are concerned, they will increase to 14.

As emphasized in the foreign press, the Pentagon is intent on having, in the near future, 15 carriers in the regular forces and on maintaining that level well into the future. With this goal in mind, the construction of NIMITZ-Class nuclear carriers is continuing. Three such ships (NIMITZ, EISENHOWER and CARL VINSON) are already in service. Three others are in various stages of construction: (THEODORE ROOSEVELT, to be turned over to the fleet this year, ABRAHAM LINCOLN--in 1989, and GEORGE WASHINGTON, which should be launched in 1991).

Along with construction of new aircraft carriers, the U.S. is also continuing the program of modernizing and expanding major overhauls of ships currently in service (except MIDWAY and CORAL SEA, which are proposed for retirement by the end of the 1980s, and beginning in the 1990s), in order to extend their service life from 30 to 45-50 years (until 2000-2015). In accordance with this program, work has already been accomplished on the carriers SARATOGA and FORRESTAL, and in August, 1987, INDEPENDENCE will complete her SLEP. Following that, the sequence is KITTY HAWK (1987-89); CONSTELLATION (1989-92); ENTERPRISE (1993-95), and so on. Starting in 2005, it is envisioned to commence modernization of NIMITZ-Class carriers.

In recent years there has been a lot of attention given to construction and modernization of warships of other types. While continuing to increase their navy's striking power, the Reagan administration is converting and reequipping four IOWA-Class battleships, (IOWA, MISSOURI, WISCONSIN and NEW JERSEY), built in WW II.

During their modernization, each ship will receive eight armored 8-box launchers for the TOMAHAWK cruise missile, four 4-box launchers for the HARPOON antiship missile and four 20-mm close-in VULCAN-PHALANX antiair batteries. In addition, the battleships are being fitted with landing pads and hangars for three helicopters, as well as state-of-the-art communications and sensor systems, fire control and electronic warfare installations. Out of the original gunfire capability on these ships, they have retained all three 406-mm, 3-barrel turrets as main armament and six 127-mm twin-barrel guns.

As of now, they have reequipped and commissioned, out of the reserve fleet, the battleships IOWA and NEW JERSEY. Modernization of MISSOURI is currently underway, with her transfer to the fleet expected by summer of 1986. Conversion and modernization of WISCONSIN is expected to begin in 1986 and completed by 1988.

There are 30 guided missile cruisers (CG) in the U.S. Fleet (9 nuclear--4 VIRGINIA-Class, 2 CALIFORNIA, TRUXTUN, BAINBRIDGE and LONG BEACH, as well as 21 with conventional power plants--3 TICONDEROGA-Class, 9 BELKNAP, and 9 LEAHY), 37 GUIDED MISSILE DESTROYERS (DDG) (4 KIDD-Class, 9 COONTZ and 23 CHARLES F. ADAMS), 32 destroyers (DD) (31 SPRUANCE-Class, and EDSON of the FORREST SHERMAN-Class from the reserves), 53 guided missile frigates (FFG) (47 OLIVER H. PERRY-Class, including 5 reserve ships and 6 BROOKE-Class), 59 frigates (46 KNOX-Class, including 7 reserve ships, 10 GARCIA-Class, 2 BRONSTEIN and GLOVER) and 6 PEGASUS-Class hydrofoil missile patrol craft. In the Naval Reserve Fleet is the CG ALBANY and two gun cruisers DES MOINES and SALEM, four DDGs and ten DDs.

As noted in the foreign press, there are eight TICONDEROGA-Class CGs in various stages of construction (26 such ships are planned overall); the guided missile destroyer ARLEIGH BURKE (DDG51)--the lead ship of a class of 29 units; and four FFGs of the OLIVER H. PERRY-Class (51 of which will be built). Beginning with BUNKER HILL (CG 52), it is planned to equip all TICONDEROGA-Class cruisers with vertical launch systems (VLS) for antisubmarine and antiair missiles and the TOMAHAWK guided missile, which will constitute the armament for these ships. The ARLEIGH BURKE (DDG 51) keel was laid in 1985, and it is expected in the fleet in 1989. Its design tactical characteristics are: standard displacement of 8,200 t; full 8,400; length 142.1 m; beam 18 m; draft 6.1 m; 4 gas turbine engines producing 90,000 hp; maximum speed 30 kts; cruising range 5,000 miles at 20 kts; armament--two 4-box launchers for the HARPOON, two VLS for ASROC, STANDARD missile and TOMAHAWK; 127-mm single barrel gun, two 20-mm close-in VULCAN-PHALANX antiair batteries; two 3-tube torpedo launchers; and a helicopter pad. The crew consists of 271 personnel, of which 21 are officers. ARLEIGH BURKE-Class is planned to replace DDGs of the COONTZ and CHARLES F. ADAMS-Class.

According to information in the foreign press, the navy command intends to begin development of a new class DDG, the DDG-80 (along the lines of ARLEIGH BURKE), and to build 31 such ships. It will have a highly improved propulsion plant, and the most modern weapons. Construction of the DDG 80 is expected to begin in the mid-1990s.

The amphibious forces, designated to carry out assault landing operations, have achieved considerable growth in the U.S. fleet. The principal damands levied on these ships are: to assure a speedy transit of Marines and their equipment across the ocean and to land them on undeveloped beaches under heavy opposition both from land and sea.

According to JANES, the U.S. active fleet includes 63 landing ships and transports, with which it is possible to completely lift and land one and a third Marine Expeditionary Divisions. In this number are 2 (BLUE RIDGE-Class) command/staff ships; 5 (TARAWA-Class) multipurpose ships; 7 (IWO JIMA-Class)

helicopter carriers; 13 LHD (11 AUSTIN-Class and 2 RALEIGH); 20 NEWPORT-Class LSTs (2 of which are in the reserves); 11 LSDs (2 WHIDBEY ISLAND, 5 ANCHORAGE and 4 TOMASTON); and 5 cargo transports (CHARLESTON-Class).

The newest amphibious landing ships in the U.S. Navy are the WHIDBEY ISLAND-Class LSD, which began construction in 1981 (there will be 14 units in all). To augment the two now in the fleet, two others are now under construction and long lead items have been ordered for another four.

With the completion, in the 1990s, of new ships for the U.S. amphibious forces, in U.S. defense experts' estimate, the lift capacity will increase to 1.5 Marine Expeditionary Divisions.

The foreign press reports, as well, that in 1985, construction was begun on the multipurpose assault ship WASP, (LHD 1)--the lead ship in an 11-unit class. Its principal characteristics are: full displacement about 40,500 t; length 257.3 m; flight deck width 32.3 m; draft 8 m; gas turbine propulsion of 140,000 hp; maximum speed of 24 kts; armament--two 8-missile launcher systems for SEA SPARROW, and three 20-mm close-in VULCAN-PHALANX air defense systems. It has a crew of 1,080 (98 officers). The ship can embark 1,873 Marines, as well as helicopters (cargo helicopters--CH-46 SEA KNIGHT, CH-53E SUPER STALLION and CH-53D SEA STALLION; ASW--SH-60B SEA HAWK LAMPS; fire support--UH-1E IRIQUOIS and AH-1T SEA COBRA) and AV-8B VSTOL aircraft, in connection with which, depending on the type of mission assigned, the following combinations are possible: 42 helicopters, or 30 helicopters and 6-8 VSTOL, or 20 VSTOL and 4-6 helicopters. Delivery to the fleet of WASP is expected in 1989. When the last of this class is commissioned, the IWO JIMA-Class will be retired.

The U.S. Navy command pays a great deal of attention to equipping landing ships with modern amphibious assault resources. The system with the greatest prospects is the air cushion craft LCAC (empty weight 87.2 t; maximum speed 50 kts; cruising range 300 miles at 35 kts, full load capacity 60 t). As emphasized in the foreign press, employment of these craft permits a considerable increase in the number of amphibious assault detachments; permits landings over a wider front; increases security of the amphibious shipping (their holding and/or maneuvering areas can be removed to distances as far as 30 miles from shore); allows an increase in tempo of troop landing; and, enables a rapid buildup of landed forces. Judging by the material in JANES, more than 90 such craft will be constructed, 2 of which have already been delivered to the fleet.

As seen in the foreign defense press, the U.S. Navy has 22 minesweeper ships (21 AGGRESSIVE-Class, minesweepers, 18 of which are in the reserves, and 1 AVENGER-Class), along with 23 RG-53D minesweeper-helicopters which can be based on carriers, general-purpose amphibious ships, and amphibious helicopter carriers. The AGGRESSIVE-Class sweepers were constructed in the 1950s, and are now obsolete. To replace them, they are considering construction of new minesweepers: 14 AVENGER-Class (full load displacement 1,040 t) and 17 CARDINAL-Class minehunters (470 t). The lead ship in the AVENGER-Class was laid down in 1983, and delivered to the fleet at the end of 1985. Four other of these minesweepers are in various stages of construction and the entire

series will be finished by 1990. Orders for construction of the lead CARDINAL-Class minehunter were delivered in 1984, and it is expected to be commissioned in 1987; while the entire class finishes construction in 1992. Upon conclusion of construction, 8 AVENGERs and all 17 CARDINALs will be transferred to the reserve fleet. In addition, entry into the fleet of new helicopter-minesweepers, MH-53E (44 in all) is expected starting in 1987 to replace the RH-53D.

Development of support shipping is being accomplished in line with ultimate consolidation and construction of multi-product supply ships. About 20 such ships are in various stages of construction.

In American military specialists' estimate, the U.S. Navy will include, by 1990, 41 SSBNs and 100 SSNs, 16 CVs/CVNs, 4 battleships, about 240 cruisers, destroyers and frigates, 30 minesweepers, 6 hydrofoil missile boats, amphibious shipping and transports in sufficient quantity for the simultaneous lift of 1.5 Marine Expeditionary Divisions, as well as required support ships. Submarines, combatants and ships which become obsolete by that time will be retired.

GREAT BRITAIN has the most powerful navy in Western Europe, and is assigned an important role in putting into practice the aggressive concepts of the country's and NATO's ruling circles. The Royal Navy includes 160 combatants (4 SSBNs, 14 SSNs and 15 SS; 3 ASW carriers, 15 DDGs3; 25 FFGs, 15 FFs, 13 small patrol craft for defense of the 200-mile economic zone, 11 amphibious and 45 minesweeping ships), 5 coastal and 47 landing craft, as well as 227 support ships and cutters. In the reserve is the ASW carrier HERMES. Royal Navy aviation includes more than 30 SEA HARRIER VSTOL aircraft; over 160 helicopters (of which more than 110 are for ASW, around 40 for amphibious transport and 12 for the marines); as well as almost 180 support airplanes and helicopters. In support of the fleet, in addition, over 30 NIMROD shore-based patrol aircraft belonging to the RAF are available. The Royal Navy numbers 71,300 personnel, of which 60,300 are in the navy, 4,000 in naval aviation, and 7,000 in the Royal Marines.

Following in the wake of the militaristic course set by the U.S. and NATO, the conservative government of Mrs. Thatcher is speeding up preparations for a new war. Here they are paying special attention to further improvements in nuclear weapons, a qualitative improvement in their combatant ships and aircraft holdings by commissioning new modern submarines, surface ships of various classes, aircraft and helicopters.

As reported in JANES, in accordance with the current CHEVALINE program, there will be a conversion and rearming of the SSBN RESOLUTION with POLARIS-A3TK (equipped with the separable reentry vehicle MIRV with six 40-kt independently targettable warheads) in place of the POLARIS-A3 (with three 200-kt nontargettable warheads). Furthermore, when these submarines reach the limits of their service lives (25 years) in the beginning of the 1990s, it has been decided to replace them with new generation submarines with the TRIDENT-2 missile. Four such SSBNs are planned (15,000 ton displacement with 16 missiles each). Keel laying of the lead ship is planned for this current year with delivery to the fleet in 1993.

In 1985, the following units entered the fleet: HMS TIRELESS (TRAFALGAR-Class SSN)--the third of seven to be built; HMS ARK ROYAL, R09 ASW carrier--the third and last of the INVINCIBLE-Class; HMS BRAVE (FFG 94)--the seventh of the BROADSWORD-Class; four RIVER-Class minesweepers; and a small patrol craft. Construction was also concluded on the SHEFFIELD-class DDG series (14 units in all--12 in the fleet and 2 sunk in the Anglo-Argentine conflict).

According to the foreign press, orders have been placed for and, at the present time, there are under construction three TRAFALGAR-Class SSNs; one diesel SS, UPHOLDER--the lead unit in the TYPE 2400 series (laid down in 1984, possible delivery date is 1987. The number of boats in this series is undetermined and they are a replacement for the OBERON-Class); five BROADSWORD-Class FFGs; several minehunters of the BRECON-Class; RIVER-Class minesweepers and landing craft.

In addition, the Royal Navy has expanded the construction of PROJECT 23 FFGs. An order was placed in 1984 for the lead ship, NORFOLK, while the second was planned to be ordered in 1985. As indicated in the foreign press, it is planned to have 24 such ships in the fleet (construction has been approved for the first series of 8 ships). Their design characteristics are: standard displacement, 3,000 t; full, 3,700 t; length overall, 133 m, waterline, 123 m; maximum beam, 16.2 m, beam at waterline, 15 m; power plant--two gas turbine engines rated at 18,700 hp each; four 1,500-hp generators; maximum speed 28 kts; cruising range 7,800 miles at 15 kts; armament--eight antiship missile launchers (possibly HARPOON); VLS for the SEA WOLF antiair missile (32 launch boxes); a 114-mm gun; two 30- or 20-mm air defense batteries; two 3-tube torpedo launchers; one or two helicopters. These ships, which have a 160-man crew, are replacements for the LEANDER-Class frigates.

Ship modernization receives particular attention, especially in arming submarines with the HARPOON antiship missile. According to British military specialists, equipping submarines with these missiles considerably enhances submarine striking power and that of the NAVY as a whole.

Lessons learned from the Anglo-Argentine conflict in the South Atlantic, over the Falkland Islands, have influenced the development of the British fleet. Specifically, on ships of all basic classes now under construction, they plan to install modern antiair missile and gun batteries for defense against antiship missiles and aircraft attacking from very low altitudes, as well as gun installations of heavier caliber. They are also giving considerable attention to increasing measures to combat fires (improved construction, reductions in the amount of flammable materials, improved firefighting equipment and individual personnel protection systems); and quantitative improvement in crew survival training. All these and other measures undertaken will, according to Western military specialists, promote a further increase in Royal Navy capabilities.

1. ETHAN ALLEN-Class unite have been deconfigured as SSBNs, but their missile bays have been retained in entirety. They are now configured for transport and amphibious landing assignments.

2. INDEPENDENCE (CV 62) [FORRESTAL-Class] is undergoing major overhaul and refit under the Service Life Extension Program (SLEP).

3. Three of these--BRISTOL and two of the COUNTY-Class have a full load displacement of 7,100 and 6,200 t respectively. Some foreign sources classify them as light cruisers. Editor.

(To be concluded)



9355
CSO: 1801/129

## AMERICAN OHIO-CLASS MISSILE SUBMARINES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 64-69

[Article by Capt 1st Rank V. Kipov; "American OHIO-Class Missile Submarines"]

[Text] The U.S. military-political leadership, while striving to achieve military superiority over the Soviet Union, is laying special emphasis on the development of strategic offensive armaments, designed to delivery surprise nuclear strikes in order to "decapitate and disarm" the enemy (according to terminology accepted in Washington). At the same time, it has in mind that: anti-satellite strike complexes will destroy Soviet space systems for warning about nuclear missile attacks; precision land-based and sea-based ballistic missiles will strike state and military leadership organs, strategic nuclear forces and other military targets; and an anti-missile defense system will intercept in flight all the Soviet Union's strategic missiles which had been retained and launched for a retaliatory strike.

While carrying out [its] delerious plans, "Star Wars," the Pentagon is paying much attention to the long-term multi-billion dollar TRIDENT program, directed at further improvement of sea-based nuclear missile forces.

As is well known, these forces were formed in 1960-1967. In that period, 41 nuclear powered missile submarines were built and transferred to the fleet. As early as 1968, the Pentagon had decided to begin the development of the TRIDENT nuclear missile system, including new submarines and ballistic missiles.

Having validated the necessity for adopting the above-mentioned program, the American command emphasized that its realization will increase the survivability of the submarine nuclear missile system since, equipping SSBNs with long-range missiles will permit them to patrol directly off the coast of the U.S., i.e., in areas covered by fixed and mobile ASW resources. It is believed also that the proximity of the submarines to the American continent will simplify their control.

As reported in the foreign press, at the beginning stage of the SSBN design (the lead ship was named OHIO) several hundred variations of its design, the arrangement and number of its missile tubes were examined. As a result, they

selected the traditional layout, previously verified during the multi-year operation of the POLARIS and POSEIDON submarine systems. At the same time, it was decided to increase the hull length and beam, which would permit having 50 per cent more missiles, provide reserve volume for missile tubes for subsequent back-fitting the submarines with more powerful missiles and also to accommodate a larger nuclear reactor.

According to Western Press data, the OHIO-Class SSBN has the following principal characteristics: surface displacement, 16,000 t, submerged, 18,700 t; overall length, 170.7 m, at the waterline, 164 m; beam, 12.8 m (beam at the waterline, 11.8 m); draft, 10.8 m; power plant, 60,000 hp; submerged speed, 25-30 kts; depth of submergence, about 300 m; crew size, 130; armament, 24 ballistic missiles and 4 533-mm torpedo tubes.

During the SSBN's development, the following scientific and technical achievements were used in the field of submarine construction, specifically, the question of optimizing the hull form; shielding the hull structure, mechanizms and apparatusus from underwater explosions; improving the secrecy; and reducing the acoustic, magnetic, hydrodynamic, radiation, thermal and other physical fields. As a result of significant increases in displacement and principal dimensions, there is a reserve internal volume for carrying out modernization during the construction of subsequent boats and also while they are being operated.

During construction of the SSBNs, wide use is made of sound isolating materials, covering both the machinery and instruments themselves and where they are attached to the decks and bulkheads. Along with the large-size machinery with a relatively high noise level on the OHIO-Class submarine, in the quiet speed mode, small size pumps, compressors and other various types of units are used.

The OHIO-Class SSBN is single hull. The pressure hull, for a large part of its length, forms the outer contour and has a cylindrical shape and terminates with a well-steamlined bow and stern extremities of light construction. It is welded, divided by watertight bulkheads into compartments and internal annular frames, spaced along the entire length, provide sufficient strength of construction. The internal bulkheads are flat but the annular [rings] have the shape of a truncated cone (Fig. 2).

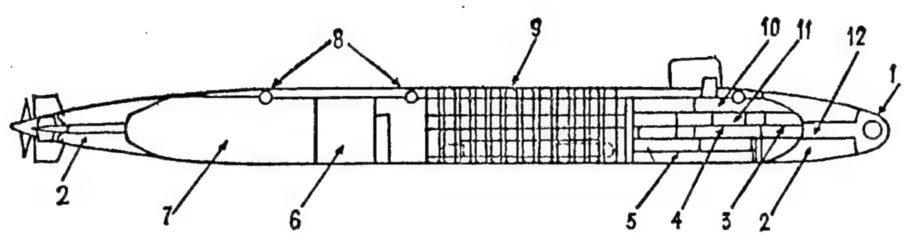



Figure 2. OHIO-Class SSBN Schematic: 1. Spherical sonar array; 2. Main ballast tanks; 3. Torpedo tubes; 4. Space for storing reload torpedoes; 5. Storage battery; 6. Reactor compartment; 7. Turbine compartment; 8. Cargo hatch and escape trunk; 9. Missile compartment; 10. Control room; 11. Living spaces; 12. Sonar array access shaft.

The bow compartment, intended for duty and living accommodations, is divided by decks and platforms into four levels. The control room, sonar, radio, and navigation rooms are located on the first level and the living quarters, computer and data processing equipment on the second. The torpedo tubes and spare torpedoes are stowed on the lower levels and, in the hold, the storage battery. The submarine's largest compartment (the missile compartment) houses 24 vertical launch tubes, fire control center, and launch equipment. The nuclear reactor (General Electric) is in the reactor compartment and, in the next compatment, there are two pairs of turbines with reduction gears.

In the bow, missile and stern sections in the upper part of the pressure hull are located the cargo hatches (diameter, 1.83 m), covered with removeable plates, through which the units of the various systems and mechanizms are replaced during overhaul or modernization. The hatches are equipped with personnel escape trunks.

The superstructure is located on the upper part of the hull. It is free flooding and is streamlined and covers the upper part of the launch tubes. The towed sonar array, various conduits, signal buoys, and mooring equipment are stowed in it.

The spherical sonar array, main ballast tanks, and anchor assembly are housed in the forward streamlined structure, attached to the end of the boat's hull. The main ballast tanks, shafting and propellors, vertical and horizontal rudders with linkages, the vertical and horizontal stabilizers, and towed sonar array are housed in the stern section, which also has a streamlined shape, and which creates optimal conditions for the propulsion equipment.

The mast fairwater has the airfoil shape which is traditional for American submarines, and is shifted to submarine's bow. The navigation bridge (height above the control room deck is 6.5 m), access hatch, mast fairwaters for the compressor, periscopes and antennas are house in it. Type HY-100 steel (yield strength, 70 kg/mm2), is used as the primary construction material.

The launch tubes are arranged in the compartment side by side in two rows, and numbered from forward aft (the starboard row has uneven and the port, even numbers). The MK98 missile fire control system, developed by General Electric, provides for a TRIDENT missile launch at intervals of less than one minute. Using it, the prelaunch preparation, the check of the working order and the monitoring of the readiness of the installation and a specific missile for firing is carried out. When firing in automatic, the entire missile load is launched in the following sequence: tubes 1-24-3-22-5-20, etc. When launching singly or a salvo of two-three missiles, any tubes, at random can be chosen.

The TRIDENT-1 (see table) missile designers were given the task of increasing the range up to 7,400 km, to match the POSEIDON-C3, but at the same time, preserve its accuracy (circular error probable (CEP) of 450 m). Foreign reviewers considered, as one of the novelties of the design, the use of an aerodynamic spike which, after the missile is launched, is pushed out of its nose cone, resulting in a 50 percent reduction in frontal drag and an increase in range of 550 km. Additionally, since the spike replaces the conical fairing itself, a more-circular nose cone was adopted which allowed housing in it not

only the warhead, but also the third stage engine. The missile's range was increased by 40 per cent by using a new high-energy propellant, and by 35 per cent by using composite materials in the rocket motors. The TRIDENT-1 warhead, which separates, is provided with eight warheads, each having a yield of 100 kt. The inertial guidance system consists of an inertial measuring device and an on-board computer and a supplementary astrocorrection system. Western specialists believe that, using improved optical devices in the latter, will allow, in the future, reducing the CEP to as little as 225 m.

AMERICAN SUBMARINE-LAUNCHED BALLISTIC MISSILES

| MISSILE TYPE | YEAR ENTERED SERVICE | LAUNCH WEIGHT, t | LENGTH m | DIAMETER, m | RANGE, km | WARHEAD TYPE, No. WARHEADS X YIELD, kt |
|---|---|---|---|---|---|---|
| POLARIS-A1 | 1960 | 13.1 | 8.7 | 1.37 | 2,200 | Single |
| POLARIS-A2 | 1962 | 13.6 | 9.5 | 1.37 | 2,800 | Single |
| POLARIS-A3 | 1964 | 15.9 | 9.9 | 1.37 | 4,600 | MRV, 3X200 |
| POSEIDON-C3 | 1971 | 29.5 | 10.4 | 1.88 | 4,600 | MIRV, 10X50 |
| TRIDENT-1 | 1979 | 31.8 | 10.4 | 1.88 | 7,400 | MIRV, 8X100 |
| TRIDENT-2 | 1989 | 57.5 | 13.3 | 2.1 | 11,000 | MIRV, 14X150 or 7X600 |

The TRIDENT-1 missile was developed and is produced by Lockheed. Its first test launch took place in 1977, and a special retrofit in 1978-1982, equipped 12 former LAFAYETTE-Class SSBNs with these missiles. The TRIDENT-1 are also in the armament of the first eight OHIO-Class SSBNs.

The country's military and political leadership introduced the stipulation that the sea component of the strategic "Triad" have the capability to destroy various targets, including launch equipment in silos, and other protected targets. On this basis, the U.S. Navy, as early as 1980, had started developing the TRIDENT-2 missile, which is distinguished by improved accuracy, increased range and a more powerful warhead. OHIO-Class SSBNs, beginning with the ninth, will be equipped with such missiles as soon as they are built, and the first eight boats, during an expanded overhaul which is planned after they have been in the fleet ten years. It is reported that the entire retrofit process (to begin in 1991) will take several years.

Judging by foreign press data, the TRIDENT-2 missile will have a still greater range, 11,000 km. There are reports of the development of several variants of it. In the first, it is envisioned increasing the missile length from 10.38 m to 13.95 m (the diameter, remains 1.88 m), and in the second, [increase] the

diameter to 2.1 m, in so doing, it will completely fill the volume of the launch tube. Correspondingly, the make up of the warhead will be changed: in it, in place of the 8 100-kt warheads, there will be 14 150-kt or 7 600-kt warheads. A 2-stage variant of the missile, with a payload of up to ten 335-kt warheads is being studied. All these ballistic missile variants being installed in submarines must satisfy the basic requirement--to approach land-based intercontinental ballistic missiles in their capabilities.

The accuracy of missile firing depends directly on the accuracy of determining the submarine's position at the time of launch. The basis of the OHIO-Class SSBN's navigation system, as in boats of earlier classes, consists of two sets of MK2 SINS (shipboard inertial navigation system), made by Rockwell. A gyroscope with an electrostatically-suspended rotor (a small beryllium ball 1 cm in diameter and weighing 1 gr rotates at 150,000 rpm in a vacuum chamber), included in the [navigation] suite, allowed an increase in the time between observations, when the boat comes to the surface and is detected more easily by enemy forces. The gyroscope itself is housed in a Cardan suspension. The SSBN's navigation equipment include an OMEGA RNS (radio navigation system), LORAN-C and also TRANSIT satellite systems and NAVSTAR (accuracy of coordinate determination is 30-100 m).

Besides the missile armament, the OHIO-Class submarines are equipped with four MK68 single-tube torpedo tubes (length, 6.4 m, diameter, 533 mm) located side by side in pairs, at an angle to the ship's longitudinal centerline and equipment for an automatic loading system. These submarines' principal selfdefense weapons are the American state-of-the-art MK48 torpedo, wire-guided using the MK118 system. It allows tracking eight targets and guiding two torpedoes simultaneously. In addition to the torpedoes, it is possible to arm SSBNs with the HARPOON antiship missile, launched also from the torpedo tubes.

The boat's sonar equipment is combined in the AN/BQQ-6 installation which has digital data processing. The spherical fixed array (diameter approximately 4.6 m) is housed in the tip of the bow. Its sound-transmitting dome is made of fiberglass. The low frequency AN/BQR-15 hydrophone system has a towed linear array (diameter, 82.5 mm). The tow line is about 700 m long, and has a 12 mm diameter. When towing the array, the speed of advance is reduced to not more than 0.5 kts.

The AN/BPS-15 radar is used to detect surface targets. Equipment for super long wave [LF], short wave [HF] and ultra short wave [UHF] bands is located in the radio room. Envisioned also is the installation of receiving equipment for the extremely low frequency [ELF] band, the signal of which, as reported in the foreign press, can penetrate water to a depth of 90 m.

Operational control of all shipboard systems, including the missile, and torpedo weapons, sonar, navigation, and communications equipment, is carried out by a computer installation, which includes as AN/UYK-20 computer combined with an AN/UYK-7 central computer.

If the first American SSBNs were operated without repair at a yard for approximately four years (such a limitation was called for mainly by the

necessity to recore the reactor), then the OHIO-Class submarines will a 10-year operating cycle between major overhauls, thanks to the development of an active reactor zone with a significantly larger energy content. Repair of the first eight SSBNs of this class, planned for the 1990s, envisions not only an exchange of the heat generating reactor elements, but also backfitting the submarines for the TRIDENT-2 missile.

The nuclear power plant used in the OHIO-Class submarine, provides a fairly high low-noise speed and allows the boat to break away from the surface ships tracking it. The new water-moderated type S8G reactor has a designed power of 60,000 hp. However, several foreign observers believe that it failed to achieve it, and in practice, it comes to about 35,000 hp. At patrol speeds, the first loop's circulating pumps do not operate, the heat transfer medium is circulated by convection, and the submarine's noisiness is reduced. The power plant is comprised also of two steam turbines with reduction gears and a single shaft propulsion system. As reported in the foreign press, the power plant allows the SSBN to develop underwater speeds of 25-30 kts.

The OHIO-Class SSBNs are built at the General Dynamics Electric Boat Shipyard in Groton (Connecticut). The building time for one boat is 5-6 years: Development work is carried on for 1-2 years, during which about 20 per cent of the total construction work is completed; not less than three years pass from the time the hull is begun until the ships is launched; the SSBN is outfitting for about a year in the water and, after conducting yard trials, a period of about two months, [she] is transferred to the fleet. Before the SSBN gets underway from Groton the first time, the track down the Thames river and the 60-180-m wide channel is worked out on a trainer and a computer,into which the boat's maneuvering characteristics, depth values, and the navigation situation are entered. The transit is made on the surface at a speed of 8-12 kts and requires the completion of turns up to 400, and passing on-coming warships and merchant ships. In specific parts of the transit, the SSBN is turned using tugs.

The lead SSBN was commissioned at the end of 1981, and in October 1982, after shakedown training, began a combat patrol in the Pacific. In accordance with the stated program, the building of not fewer than 24 SSBNs (576 launch tubes) is envisaged. Six boats have already been transferred to the fleet: OHIO, MICHIGAN, FLORIDA, GEORGIA, HENRY M. JACKSON, and ALABAMA (SSBNs 726-731). Six others are in various stages of construction, and two of them will be transferred to the fleet during 1986. According to foreign press data, in 1990, the number of OHIO-Class SSBNs in commission will reach 12 units and 10 more can be built in the 1990s.

The OHIO-Class SSBNs patrol in the Pacific and are based at the SSBN base at Bangor (Washington). More than 20 years of experience of servicing the POLARIS and POSEIDON submarine missile systems has allowed the navy command to shorten the repair and rehabilitation period from 30 to 25 days. Combat patrols last 70 days. There will be 66 per cent of the total number of boats as opposed to the current 55 per cent.

A base is being built on the U.S. Atlantic coast at Kings Bay (Georgia) for SSBNs with TRIDENT-2 missiles. The base is scheduled for completion in 1989.

SSBN Squadron SIXTEEN, with LAFAYETTE-Class SSBNs, equipped with TRIDENT-1 missiles, is based there at the present time. A specially equipped tender services these boats.

Foreign press reports testify to the fact that despite the constant increase in the cost of SSBNs (construction of the lead [ship] was put at 1.2 billion dollars and, according to the 1985 budget, 1.8 billion has been requested for the 12th), and the program to develop the sea-based nuclear missile forces is steadily being fulfilled. This encourages strengthening the nuclear blackmail on the part of U.S. ruling circles, and the further accumulation of nuclear power to be used for aggressive purposes.



9355
CSO: 1801/129

## DUTCH GOALKEEPER ANTI-AIRCRAFT BATTERY

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 71-72

[Article by Capt 1st Rank R. Mochalov; " The Dutch GOALKEEPER Anti-Aircraft Battery"]

[Text] Anti-ship missiles (PKR), were widely developed in past years in the navies of many capitalistic countries, which lead to the necessity to create an effective means of combatting them. In this case, according to foreign specialists' opinion, the main problem is to detect a PKR (effective radar cross section of 0.1 m2), flying at M=0.9 at an altitude of 3-5 meters above the water, which reflects radar signals and effectively masks the target.

Shipborne autonomous gun systems for destroying antiship missiles in the close-in PVO zone, which have an extremely low trajectory have already been developed in the navies of a number of capitalistic countries of the aggressive NATO bloc. For example, the Dutch firm Signaal Apparaten and the American firm General Electric developed the GOAL KEEPER anti-aircraft artillery system, the structural system of which is shown in Fig. 1.

The system has the following main requirements: detect any highspeed target flying at low or extremely low altitude or diving toward a target; operate in conditions of various natural interference (reflected radar signals from the surface of the water, rain, etc.) during any weather; automatically and continuously assess the situation, determine the priority of targets, and have a short reaction time; receive unambiguous information on the target for mathematical signal processing; use state-of-the-art electronic equipment, which support the calculation of possible enemy PKR trajectories; accomplish fire correction automatically in order to insure the maximum number of hits on the target; have a small dispersion pattern even during lengthy firing phases; be installed on a stabilized platform in order to insure reliable target designation and an increase in fire accuracy; possess high reliability and a rapid rate of fire. The shells must possess high kinetic energy in order to break through several metal barriers, including the missile warhead's armored protection (with the impact of a shell into the missiles' warhead, the missile must explode).

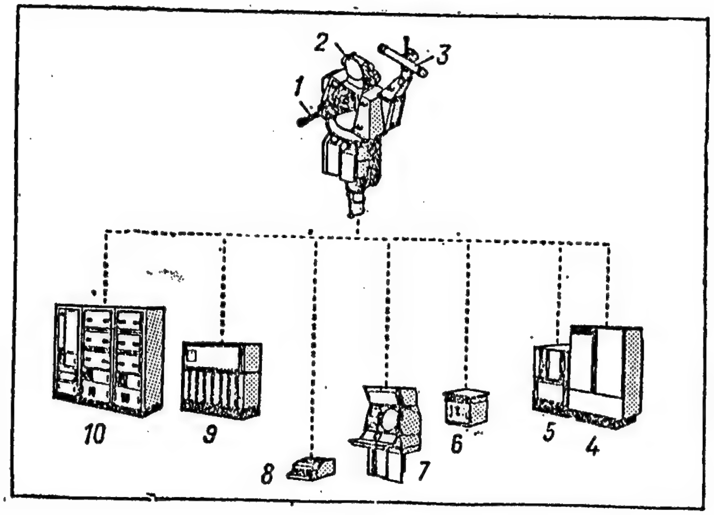



Figure 1. Schematic of the GOALKEEPER
Close-In Anti-Aircraft Gun System

1. The EX-83 gun mount with a magazine and power system; 2. Tracking radar antenna assembly with a transciever operating in the 8-mm band and a television camera; 3. Search radar and side-lob suppression antennas; 4. Transmitter operating in the 3-cm band; 5. Receiver and frequency retuning unit; 6. Waveguide dryer; 7. Control panel; 8. Control printer; 10. Rack with electronic fire control equipment.

The American EX-83 gun mount and the Dutch fire control system meet the stated requirements. The gun mount is being developed by General Electric on the basis of the production model of the seven-barrel GAU-8/A aircraft cannon (Fig. 2) with a revolving barrel unit and linkless feed. It is reliable (approximately 33,000 rounds per malfunction and 150,000 for a failure), has high firing and guidance accuracy. The magazine has a capacity of 1,200 rounds and the ammunition feed system, located in an under-deck compartment, revolves along with the mounting on which the GAU-8/A cannon is located, which allows the size of the gun turret to be reduced. The magazine is loaded in 20 minutes using a mechanical device with the ammunition completely expended and in 9 minutes using a bulk loader. Charging the magazine is accomplished at any time. Safety of personnel is achieved because it is loaded in the under-deck compartment.

A sub-calibre shell with a separate bottom and tungsten core (Fig. 3) is used in the gun mounting. Standard armor-piercing incendiary and high-explosive incendiary shells with plastic grommets are used for firing against aerial or sea targets. The viability of the barrels with the use of such grommets consists of 21,000 rounds. During combat fire by the system, the duration of typical firing phase against a PKR lasts 3 seconds (190 shells), but may not exceed 5 seconds. According to specialists' assessments, not less than 12 shells hit the missiles warhead if the fire lasts 3 seconds. The barrels of

the gun mounting maintain a fire lasting 8 seconds (560 shells), after which a short interruption is necessary to cool them.

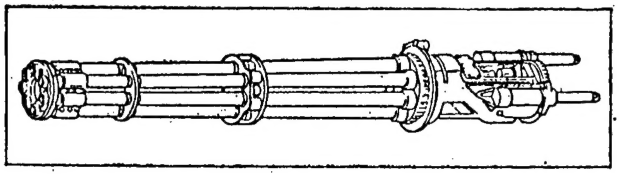


Figure 2. The General Electric GAY-8A 7-Barrel Recoil Gun.

The battery's control system is being developed by the firm Signaal Apparaten on the basis of the VL4/41 FLY CATCHER, which is widely used in the anti-aircraft-missile and anti-aircraft artillery systems of the ground forces. It includes a target tracking and fire control radar, a computer, an operator console with a display unit and control elements.

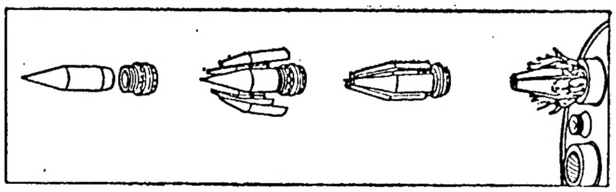


Figure 3. The Exit of the Sub-Caliber Shell from the Barrel, the Casing Base disc and Its Own Base Disc.

The coherent-pulse search radar operates in the 3 cm wave band and reliably detects low flying targets at ranges up to 20 km, in any weather. The capabilities of the search radar in conditions of radioelectronic suppression and interference, arising with the reflection of radar signals from the surface of the water and rain, are increased due to a fast tuning of the carrier frequency and the operation with variable frequency of tracking impulses. The Digital units detect the moving targets in conditions of interference, determine the unambiguous range to them and the flight speed.

The slotted wave-guide type antennas of the search radar (stabilized along two axes, the rotation speed is 60 rpm, the width of the beam pattern in elevation is 300, and in azimuth 1.50) and side-lobe suppression is mounted on a separate console and not mechanically connected with the oscillating part of the gun mounting. This allows continuous target tracking. In addition, the radar can track while scaning, and, at the same time, the current coordinates of several targets are entered into the comnputer, which determines the most

dangerous one and sends information on it to the tracking radar. The automatic search and target tracking process, and also fire cover insures its rapid transfer from one target to another while repelling an attack by several PKR.

The target tracking and fire control radar operates in the 3- cm and 8-mm bands. In the latter, a narrow directional beam is formed, which allows targets, flying at extremely low altitudes at sea level, to be tracked continuously. It also screens the station from receiving signals reflected from the surface of the water and clouds. A Cassegrain antenna with a diameter of one meter is used in the tracking radar and is installed on the oscillating part of the gun mount. A mono-pulse preamplifier in the 3-cm band and a mono-pulse transmitter and receiver in the 8-mm band are mounted on one unit. A television camera, which allows the operator to observe a target on the display unit, assess the firing results and also track it manually in emergency situations, is located on the antenna's reflector assembly. The television camera is used actively for training the personnel. It is noted that it tracked small supersonic missiles, flying at an altitude at sea level during system trials.

A universal computer of the firm Signaal Apparaten controls the stabilization system of the gun mount, the operation of the servo-mechanism, processes initial information and current target coordinates, and controls the opening and conduct of fire (automatically corrects the angle of divergence between the missile's path and the target). According to foreign specialists' assessment, GOAL KEEPER allows the first of two missiles flying one after another, which are attacking the ship from one direction, to be destroyed at a range of 600 m, and the second guided missile at a range of 400 m with a 0.95 probability.

The first ten GOALKEEPER anti-aircraft gun installations were ordered for the Dutch Navy in the beginning of 1984. Eight such complexes were ordered by Great Britain. The naval commands of a number of capitalist countries, including the United States, are studying the possibility of using it for the armament of their ships.



9355
CSO: 1801/129

## ISRAELI TOGER ATGM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 86 (Signed to press 10 Jan 86) pp 91-92

[Article by Lt Col V. Nesterenko; "The Israeli TOGER ATGM"]

[Text] Israel has completed development of its first domestic anti-tank missile system named TOGER. The foreign press reports that wide use was made of American technology, the accessibility of which is always open to Israel's military-industrial complex. The American TOW ATGM, in service in the Israeli ground forces, was used as the prototype. The new system was created with two variants: the first is portable and the second is intended to be mounted on various kinds of combat and transport equipment. The maximum range is 4.5 km.

In contrast to the American TOW ATGM system, the TOGER has a wireless guidance system, where the guidance of the anti-tank missile is done be laser beam. It employs a laser transmitter that operates in the infrared wave band. It is located on the launcher and is designed to work in conjunction with the optical sight, which the operator uses to track the target. The laser receiver is located on the tail portion of the ATGM. An automatic pilot controls the position of the missile relative to the laser beam and the guidance commands on the fins. The maximum in-flight speed of the missile is 315 m/sec.

The Western military press points out that the use of a laser in an ATGM's guidance system provides more reliability in combat, particularly under bad visibility conditions, and a better probability (no less than 0.9) of hitting the target.

The TOGER ATGM system is equipped with a warhead that, from a design standpoint, is similar to the warhead of the American TOW-2 anti-tank missile. The weight of the hollow charge is 3.6 kg and its diameter is 144.4 mm. The sensing element of the fuse is moved forward to assure that the charge will explode at the optimal distance away from the target to form the hollow charge jet. Israel's specialists stress that the armor penetrability of the TOGER ATGM is up to 800 mm when fired at homogeneous rolled armor. The length of the missile (with projecting pin) is 1,450 mm, its diameter in 148 mm, and the weight is 18.5 kg.

The aiming and launching equipment for the portable variant of the TOGER system is mounted on a tripod and has hand-operated controls. The anti-tank missile goes inside a transport and launching container (total weight is 29 kg).

Based on reports from the foreign press, the new ATGM is planned to be manufactured both for the Israeli ground forces and for export.



9355
CSO: 1801/129